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PRESIDENTIAL ADDRESS *

By JAMES D. BRUCE, M.D., F.A.C.P., *Ann Arbor, Michigan*

As I review my association with the American College of Physicians during the past year and during the twelve years I have been privileged to serve on the Board of Governors and later on the Board of Regents, I should be remiss in appreciation if I failed to pay tribute to the fine spirit that has characterized our Officials, the Boards of Regents and Governors, and indeed our entire membership. During my many years in practice I have always been associated with medical organizations and in none have I found more altruism, devotion and high purpose than in this College.

A notable achievement of the year just closing is the completion of the historical record of the College to 1940. While this may properly be included among the important events of the past year, attention should be called to the fact that this undertaking was begun under the presidency of Dr. Ernest B. Bradley and has been continued during intervening administrations. The history itself is a faithful record of College affairs and brings into proper perspective the ideals, purposes and personages that have made possible the College as we know it today. It is a masterly achievement and places us under deep obligation to Dr. William Gerry Morgan and his collaborators which we are glad at this time to acknowledge with appreciation and affection.

The American College of Physicians is devoted to the cause of internal medicine and is contributing in increasing degree to medical progress. It also is making noteworthy contributions through affiliation with other national bodies, particularly the central organization, the American Medical Association. The principal activities of the College are its Annual Meetings; the publication of the Annals of Internal Medicine; the maintenance of satisfactory standards of membership, which led to the organization of the Board of Internal Medicine; the encouragement of research; and, more recently, the promotion of postgraduate education.

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* Address at the Annual Convocation of the American College of Physicians, Boston, April 23, 1941.

The Annual Meeting serves many purposes. It permits the renewal of friendships among our members, encourages an exchange of experiences in our professional progress and serves to acquaint us more intimately with the medical and social practices and traditions of the various centers visited. Probably greater than all these is the opportunity which these meetings afford the younger members to meet and know the older men who have made medical history, not only in this College but in American medicine. Indeed, I think it may be said that this last purpose justifies all the effort which these meetings entail, for they do require a long period of preparation which bears heavily upon our not too large staff at National Headquarters. In this program as well as in the routine conduct of the College, we are singularly fortunate in having as our Executive Secretary, Mr. Edward R. Loveland, who combines to a rare degree business and administrative ability with a fine understanding of our professional ideals. Indeed, if there be an " indispensable man," it is he.

The ANNALS OF INTERNAL MEDICINE reflects current scientific and social advances and serves as a permanent record of College progress. It is a publication of the highest order. This is due to the quality of the presentations and to the fine discrimination, good taste and scholarly attainments of our editors who have included, besides the present incumbent, Dr. Maurice Pincoffs, Dr. Carl V. Weller, and the late Drs. Frank Smithies and Aldred Scott Warthin.

The maintenance of satisfactory standards for membership in the College requires the organization of ways and means whereby the requirements for admission to membership may be met. Obviously, the College as now constituted cannot provide these opportunities, and it is extremely doubtful if it should ever attempt to do so. It must, however, foster resources now existing throughout the country to provide educational opportunities for graduates who aspire to the specialty of internal medicine and to the affiliated specialties.

Medical education has been divided, for convenience, into four phases: the pre-medical preparatory period, the undergraduate period which satisfies state and national legal requirements for practice, the graduate period and the postgraduate period. While each phase very properly may be clearly defined, it is altogether undesirable that they be dissociated. Indeed, the study of medicine should be thought of as a continuing process.

Among the different fields of medicine and at their varying levels the greatest need is for a related and orderly balance of educational opportunities. Nothing essentially new is required, no new machinery, but there should be a fuller comprehension of the health needs of society and a more equitable application of teaching and clinical facilities. That new and separate organizations were deemed necessary for different levels of professional training has been one obstacle to advancement in medical knowledge. Is it unfair to assume that the teacher who carries the student through to graduation

should continue to guide and direct the practitioner? Is the teacher in the postgraduate or graduate school on a higher level of professional and scientific knowledge than the teacher in a similar position in the medical school? No one would claim that he is. Oftentimes, he is the same man, teaching possibly in more restricted fields, but still the same teacher with the same attainments. If for no other reason than conservation of resources and practical economy, might not the medical school through necessary enlargement of staff and collaboration with all available resources undertake the whole medical teaching program, thus making a continuous process of what are now detached and more or less isolated efforts, particularly in the graduate and postgraduate fields?

The thesis is maintained by some that what is spoken of as " true graduate work " must actually be a detached and isolated process, free, so far as medicine is concerned, from such distracting interests as the care or even the consideration of disability and sickness. Graduate education, it is argued, must be confined to a purely theoretical atmosphere. This tendency to insist upon complete separation of the student from the patient and his problems and to ignore any association between the studies at hand and their possible application in clinical medicine, has the objective of " learning for itself alone." To those who have not adapted themselves to the exigencies of a troubled world, this detachment for a three to five-year graduate period and emergence with a Doctorate of Philosophy is alluring. Something may be said for this point of view. There may come much of peace with this devotion to a single task, a quiet pleasure in this very limitation. For some, a welcome refuge. The river no longer frets among the rocks of the strenuous undergraduate period. Nor is there the glory of the dashing waterfall—the adventure into the life work for which the graduate has been preparing himself—but instead the safe and steady flowing of the water through the sluiceway to a single wheel from which productive scholarship in pure and applied science may emerge.

But is this the goal? I think not. It is again but a beginning. Tomorrow, the graduate must take his place in the actualities of life, in practice, in teaching or in further research. But in all except the last he has been transplanted unless, perchance, in order to eke out a precarious existence during the graduate period he has served as a teaching fellow or assistant. Doubtless this would have been considered unfortunate, for if he entered into his teaching with any degree of enthusiasm he must, of necessity, have become to that degree detached from the isolation deemed necessary by the particular, or is it the peculiar, approach of the cloister-bound. Our graduate is unprepared for practice, and how may he ever enter into medical research if he is unfamiliar with the demands and problems of the sick room?

My reason for stressing this matter is to call attention to the effort of certain university graduate schools to assume direction of graduate education in medicine. I am not referring to graduate schools of medicine, nor am I questioning the necessity for the inclusion of subject matter beyond the

necessary clinical and scientific phases of graduate teaching, for we are all agreed that the broader the graduate student's cultural contacts and opportunities, the more likely is he to approach soundly the problems of medical practice. What I am questioning is the wisdom of permitting the direction of medical graduate work by those but remotely connected with the professional obligations of medicine. More particularly, I am pleading for a closer communion of the four phases of medical education as a continuing process: pre-medical preparation, the four-year undergraduate period, with its internship; the graduate period, with its hospital residency and necessary academic association, and the postgraduate period which contemplates study, teaching, practice and research throughout the life of the individual.

Our objectives, ideals and educational purposes have been clearly set forth by Dr. Irons in his discussion of the activities of the American Board of Internal Medicine as factors in scholarship in American medicine, and by Dr. Bortz in his presentation on the responsibility of the College in postgraduate training. The activities of our committees on education in the Board of Regents, under the chairmanship of Dr. Hugh J. Morgan, and in the Board of Governors, under the chairmanship of Dr. Edward L. Bortz, bid fair to justify the term *College* in its traditional sense as a positive factor in education.

The inclusion of general hospitals heretofore without university or medical school affiliation in the process of continuing education will contribute greatly to our present resources. The assumption of broader educational responsibilities on the part of a general hospital will not only enter importantly into a program of continuing education, but will also serve to raise the quality of medical service within the community. This, after all, is the final objective and criterion of all medical education. With the willingness to contribute to education which so many of our general hospitals have shown, together with the interest of medical faculties, I believe we will see affiliations between all forward-going general hospital staffs and our medical schools and universities in the not distant future. Dr. Sladen's presentation on our first day's program clearly indicates this trend.

While the College is following the ideals and purposes of its founders, practically all our activities have been modified to a greater or lesser degree by the needs of the nation in the program for National Defense. As the place which this country must occupy in the present conflict and the adjustments necessary have become more apparent, the medical profession is again called upon to make heavy sacrifice. It is with pride that we note the contributions of the College to the National Research Council and the Surgeons General through the Committee on Medicine and to the many other activities in the National Preparedness Program. Indeed, this national effort is occupying many of our members to the extent of preventing their participation in this annual meeting. If this preparation for defense so greatly occupies the profession in this country, to how much greater degree must it affect our Canadian friends and members who are engaged so valiantly, not

alone in preparation for defense, but in the activities of an armed conflict! To those among them who are fully occupied in this conflict for the preservation of individual liberty and world decency, as well as to those who have been able to slip away to the meeting of this College to which they have contributed so much, may I offer profound admiration, respect and affectionate greetings.

In a program for National Defense it is essential that all citizens contribute the services which they are capable of rendering with greatest effectiveness. Total war calls for total defense, but even in the presence of actual conflict it is important to promote the security of the civilian as well as to provide for the welfare of the soldier. There is considerable evidence that we have not been producing more graduates in the Health Fields than peacetime needs demand. If men are taken out of training for these professions, there is grave doubt that the future needs of the country will be adequately met. Students, interns, and residents, if inducted immediately into service, cannot make a contribution comparable to that which may be expected of them if they are permitted to continue their training to a satisfactory conclusion. This is not a plea for the exemption of students in the health fields, or in any field of education, but is simply to call attention to the desirability of permitting students to continue their work until they are qualified for effective service. The mistake must not be made of interrupting and disrupting the continuance of our present national patterns to the detriment of oncoming generations. Conscious as we are that there will be an inevitable backwash from the war in every phase of our national life, we should keep before us at all times the possibilities of softening these impacts through wise and careful planning.

In these strenuous times it is easy to see how matters of even considerable importance may be overlooked or dealt with inadequately. While I am reluctant to criticize, failure to comment in a field in which one has intimate knowledge, and particularly some responsibility, can scarcely be justified. As a member of the Committee on Medicine of the National Research Council, I feel it an obligation to call attention to the inadequacy of support on the part of the Federal Government in matters pertaining to the health and welfare of the armed forces. The Federal budget for 1940–41 carried an appropriation of only $250,000 for the Health and Medical Committee. That this was wholly inadequate has been repeatedly called to the attention of the administration. Conservative estimates of the appropriation needed for the duties contemplated for 1941–42 range from a minimum of four million dollars to a maximum of ten million. I understand that the minimum figure of four million dollars has been requested. This sum would not be excessive if utilized in three fields alone—investigation in blood substitutes and more effective methods in transfusion, in the potentialities of chemotherapy, and in the general field of nutrition.

The importance of human conservation in both war and peace makes it mandatory that the agencies to whom this grave responsibility has been

assigned be not handicapped in their effort to provide preventive and curative measures. There can be no excuse for an administration that fails to provide all possible safeguards for the health and welfare of its people, both armed and civilian, while spending untold millions for mechanical and material preparedness, necessary as they are.

At this point I am proud to report that the Regents of the American College of Physicians appropriated $10,000 for research necessary in the medical military field and that $5,000 of that sum has been allocated by the Executive Committee on the recommendation of the Committee on Medicine of the National Research Council to the important research now being carried out at Harvard University on the possible use of bovine and human albumins as blood substitutes in transfusion. That no funds were available for the continuance and expansion of this vital work should be a matter for concern, not alone to the members of this College, but to all citizens loyally supporting an administration to which they have a right to look for the employment of every possible measure of safety for those from whom so much is being asked.

I am happy for this opportunity to congratulate those entering the College tonight. Although never a member of the Credentials Committee, on numerous occasions I have visited it. I wish I could convey to you how deeply I have been impressed with the meticulous consideration given by this Committee to the qualifications of every applicant. As you well know, certain scholastic requirements are essential, for these are something definite and in accordance with traditional educational measurements. If these were the sole criteria, however, neither you nor I could possibly have the pride in membership which is ours. Necessary as certain criteria of scholastic and professional accomplishment are, there is another qualification upon which little stress can be laid through the printed word, but which is a constant factor in evaluation for membership, and this is character.

In this period made dramatic by the utilization of mechanical devices in replacement of man power, it is essential to remember that, after all, man is the creator and master of the machine, and that the employment of inventions but increases the need for educated and trained workers. However, if initiative, devotion to ideals and love of fellow man, together with a reasonable sense of proportion, be lacking, much of this potential power brought to us by the inventive genius of man may serve merely to hasten our spiritual and material undoing. Guiding and directing all progress must ever be successive generations of trained men and women dedicated to that aristocracy of service which membership in the American College of Physicians contemplates.

MEDICAL ACTIVITIES OF THE AUGMENTED MILITARY FORCES *

By JAMES C. MAGEE, F.A.C.P., SURGEON GENERAL, U. S. ARMY,
Washington, D. C.

INTRODUCTION

IN the course of my talk to you today I shall discuss the broad aspects of the task confronting the Medical Department in the expansion of medical facilities to provide for the hospitalization of the augmented military forces and for training of its own personnel.   I ask you to bear constantly in mind that my discussion must, of necessity, deal with policies and doctrines enunciated in the Military Program of 1940–41 and covers Medical Department activities as they now exist and before the present " limited emergency " changes.

GENERAL CONSIDERATIONS

From the first phase of any expansion in the military forces, and throughout all subsequent military operations, organization must play an important part.   The present trend toward mechanization emphasizes this axiom.   The immense size of the forces which will fight wars of the future, owing to the participation of civilians, business and industrial elements as a part of the national war team, makes it obvious that a nation cannot hope to conduct a future war efficiently without most thorough *organization*.   The ever increasing use of scientific weapons—mechanization of warfare—whether or not it reduces the size of actual combat forces, will more than ever call for thorough training if the combat force is to be reasonably effective at the outbreak of hostilities.

Military medicine has two main aspects—the professional or scientific and the administrative or organizational.   Professional progress has turned upon two principal coefficients—the advancement of scientific surgery and the advancement of the science of communicable diseases.   Medico-military administration has turned upon a single factor—the need of the nation for a well-organized professional army, however small, as a mechanism for its defense in time of need and as a nucleus from which emergency expansion may occur.

Under the Military Program of 1940–41, the strength of the United States Army will be 1,400,000 by July 1, 1941.   Under this program the Medical Department is charged with providing an adequate medical service for the entire Army at posts, camps, and stations, within and without the continental United States.   The means required to accomplish this task are those concerned chiefly with personnel, training, supply, and hospitalization.

* Read at the Boston meeting of the American College of Physicians April 24, 1941.

The chief function which the Medical Department must fulfill from the initial phase of any expansion is that of providing adequate facilities for sick and injured individuals. The stay of these individuals in hospital, whether of short or long duration, demands that such facilities as hospitals, supplies, and trained personnel be available and in efficient operation *from the very beginning of any military expansion.* This is a function quite dissimilar to that of the arms, such as infantry or artillery, since variable periods of training, short or long, will usually be available prior to their actual operations.

PLANNING AND TRAINING

Many complex problems having to do with either personnel or material demand advance study and solution if the sick and injured are to be efficiently and promptly cared for. Advance plans must provide for adequate and concomitant increases in personnel and for the dislocation of key personnel in existing installations to expanding units or installations if the necessary hospitals are to be available as augmentations in the Army occur.

The inherent obligations of the Medical Department include the added responsibilities of formulating plans for and providing training in the collection, evacuation, and hospitalization of the sick and wounded in war. This means that, in addition to training officers, nurses, enlisted men, etc., for duty in military hospitals, the Medical Department must train medical personnel for duty with the field forces. The validity of this statement is evidenced by the fact that, in every tactical operation in time of war, the Medical Department must execute a major withdrawal in its evacuation and hospitalization of casualties. The difficulties of this task and the need for special training for its execution may be realized when it is considered that this withdrawal of noneffectives must be accomplished against the urgent flow of troops and supplies for the great forward battle impulse.

The Medical Department has the distinction of being the only branch in the Army having a great series of units echeloned from the very front line itself back to the farthest end of the Zone of the Interior. This must be so in order that medical service may be continuously available and that sick and wounded may be moved methodically back to that echelon of medical service where the necessary facilities for the treatment of each type of case exist. The proper balance and distribution of medical personnel, units and installations in each tactical echelon are vital to success.

To accomplish its dual mission of providing facilities to care for the current sick and injured from a greatly augmented military force and of properly training its field component so that they may participate in tactical operations, when and if necessary, the Medical Department has been allocated 76 enlisted men per 1,000 of the total force. This totals 106,000. Fifty-two (52) enlisted men per 1,000, or 73,000, have actually been made available to the Department. Basic military and specialist training must be given before these individuals may assume their proper place in a highly

technical service.   It has been necessary to employ qualified civilian technicians and specialists to supplement medical enlisted personnel in providing for the increased demands for hospitalization until our expanded training program might begin to bear fruit.

Predicated upon the fundamental doctrine that all training, commissioned and enlisted, in the Medical Department should be standardized, and upon the demonstrated results in the World War that organized instruction in camps and schools could be made to substitute to a certain extent for actual experience, the Medical Department has tremendously expanded its school facilities.   This training must be in addition to the principal mission of providing an adequate and efficient medical service to approximately 70,000 hospital beds.

Briefly, the training program as it now is expanded will provide training as follows:

a. *Medical Department Officers:*

    (1) Refresher Courses, Tactical Training-Medical Field Service School .... 500 per month

    (2) Refresher Courses, Hospital Administration (40 different courses in 6 different General Hospitals) .... 300 per month

b. *Medical Department Enlisted Technicians:*

    (Dental, Pharmacy, Roentgen-Ray, Sanitary, Veterinary, Medical, Surgical, and Laboratory) (eight specialties in seven different Special Service Schools, in General Hospitals and the Medical Field Service School) .... 1500 per month

The planning, constructing, equipping and staffing, and actual opening of these Special Service Schools has been accomplished within a period of six months.

PERSONNEL

Since the present Military Program is one of training and not one of war, I have placed a rational limitation upon the number of physicians to be assigned with tactical units.   This is evidenced by the fact that all professional units of the field forces are being activated with one-half enlisted and greatly reduced commissioned strength.   As an example, numbered general hospitals (22) are being activated with 5 officers and 250 enlisted men, whereas these units at full strength require 73 officers, 120 nurses, and 500 enlisted men. It is felt that the five officers, with our present school program, will be sufficient to give this unit efficient training within one year.   It is also felt that these units will provide the trained nucleus of enlisted personnel to activate our affiliated units, when and if it becomes necessary.   This plan will result in a considerable saving in commissioned personnel with consequently less

disruption in civilian medical service. Plans are now in motion to establish an officers' candidate school to train individuals for commissions in the Medical Administrative Corps. Utilization of this Corps, whenever and wherever possible, will further reduce our requirements for strictly medical personnel.

With all possible economy in numbers, however, the present expansion will require approximately 9,000 medical officers. The present authorized strength of medical officers in the Regular Army is 1,230. The National Guard brought into service slightly less than 1,000 medical officers. This means that about 6,800 medical officers must be drawn from civilian and Reserve sources. All of the above figures are based upon a Military Program of 1,400,000 men in the Army.

The adequacy and efficiency of medical personnel is a matter of paramount importance to the Medical Department of the Army and to the medical profession of this country. Manifestly, the 1,230 medical officers of the Regular Army cannot render adequate and efficient medical service to approximately 70,000 hospital beds and, in addition, provide the necessary tactical training and administrative overhead to a miliary force of 1,400,000. The procurement and assignment of the necessary commissioned complement to duties best suited to them and of most value to the Army entail a task of great magnitude. The National Research Council and the several committees on medical preparedness are working in close coöperation with my office in providing information of inestimable value with reference to individual Reserve Officers' capabilities and experience.

HOSPITALIZATION

The present Military Program contemplates utilizing all existing military hospital facilities to a maximum. However, since the Army has expanded ten-fold and since many new posts, devoid of hospital facilities, have been established, the problem of making available adequate bed space, at the proper place and at the proper time, has assumed urgent importance. In general, 5 per cent of the military population represents the bed requirements in station or camp hospitals, and 1 per cent additional represents the general hospital requirement. Thus, of the total 84,000 beds required 70,000 are required in station or camp hospitals and 14,000 are required in general hospitals. Hospital construction, however, has been based upon 4 per cent beds in station and 1 per cent additional in general hospitals. Prior to the present expansion approximately 21,000 beds existed in military hospitals within the continental United States. This means that the Medical Department has had to plan, construct, staff, and equip military hospitals providing approximately 50,000 beds.

FINANCE AND SUPPLY

The construction of hospitals and the procurement of personnel in sufficient numbers and partially trained for duty in military hospitals and in tac-

tical units do not entirely fulfill the medical task.   Military hospitals must, in addition, be given supplies, equipment, and utilities for operation.   The Medical Department is charged with the responsibility of procuring and distributing all medical supplies for the Army.   Medical equipment and supplies normally fall into two broad classes: those items used in the routine care of the sick and injured and those items known as field equipment.   The materials of the first category are similar to those utilized in civilian medical and surgical practice; they are commercial in nature and their rate of consumption and maintenance requirements vary directly with the size of the Army.   Field equipment and supplies, on the other hand, comprise those items and assemblies adapted primarily for emergency treatment and evacuation of battle casualties.   These items are largely noncommercial in nature and their rate of consumption varies from a very small amount in peace time to astronomical proportions during actual combat operations.

The procurement and distribution of medical equipment and supplies, while controlled by my office, have been decentralized to medical depots where the actual purchases are made and the supplies stored and issued to using agencies.   Prior to July 1941, the Medical Department will have approximately 70,000 hospital beds in slightly over 200 hospitals.   All of these hospitals will be fully equipped from mess halls to operating rooms.   This represents an expansion of about 350 per cent.

PROFESSIONAL

The Medical Department of the Army, during the expansion program, must maintain standards no less than those of the College of Physicians, which came into being to formulate and promote the highest professional ideals in the practice of medicine.   Professional activities incident to the present program are primarily concerned with environmental sanitation, water supply, sewage disposal, anti-malarial work, venereal disease control, food and dairy sanitation, and efficient medical and surgical care.   This is no small problem since, in all, there will be approximately 200 camps, posts, and stations with military populations ranging from 500 to more than 60,000. It must be manifest that the services of many agencies and many types of specialists will be required properly to perform these varied tasks.

The coöperation and active support of individuals and many civilian agencies are of paramount importance in the formulation of plans and in the execution of the heavy task laid upon the Medical Department.   Several committees of the National Research Council are now functioning and rendering valuable aid to the Professional Service Division of my office.   The Medical Department must have the support and coöperation of the profession in this nation if the type of medical service expected is to be rendered.

The Military Program of 1940–41 was designed as a training program, a preparation which the nation hopes will not only insure our peace but which will insure our being ready should the grave responsibilities of war come.

Except for battle casualties, the health and medical problems of the Medical Department will reach the same magnitude. The medical task is a distinct challenge to the medical profession of the United States. An understanding of the task and a sincerity of purpose in its successful accomplishment, augmented by the coöperation and active participation of the entire profession, will not only insure that our nation's armed forces shall receive the usual high standard of medical service but will inspire in the minds of all a high esteem for the medical profession of this country—an esteem which will be richly earned and honestly deserved.

THE PROBLEM OF THE INTERNIST IN THE NAVY *

By Ross T. McIntire, F.A.C.P., Medical Corps, U. S. N.,
The Surgeon General of the Navy

The subject of this paper which I am presenting this afternoon, " The Problem of the Internist in the Navy," may seem a bit commonplace among such a distinguished group of internists as are the Fellows of this College. However, in view of the marked increase in the personnel of the Army and Navy, it occurred to me that it might be well for me to review something of the peculiarities of the duties that face the internists in the Navy, when to you who are in civil practice like situations would be very routine matters. Because many of you may be heads of departments in our large hospitals, should we come to a complete mobilization, I wish to bring up for your consideration a number of interesting conditions. Since they are being presented by one who is not an internist in the strictest sense of the word, please realize that they are being presented from the angle of the Military Surgeon.

Briefly, let me state that the functions of the Medical Department of the Navy can be classified as:

1. The maintenance of physical fitness among our entire personnel.
2. The proper physical selection of personnel.
3. The care of the sick and injured.
4. The elimination of the unfit by retirement and medical survey.

In the first group the internist plays a modest part. It is his duty to help find means to prevent disabilities, especially due to degenerative disease. In this rôle he is often called on to perform various types of research. The officer trained in public health and sanitation has a much wider field, finding and perfecting methods for the control of epidemic and infectious diseases. We in the Navy have a definite standard that every officer and man must be physically fit to perform his duties at all times, in all places, and under any conditions. A ship, to be 100 per cent efficient, must have a mentally and physically alert crew. Nothing disrupts organization on board ship more than men on the sick list. Take for example a gun crew on any of our ships: here we find team work in its highest state of efficiency. Every man is a specialist in his assigned task. The gun pointer spends many hours finding means to increase the speed with which he can get on his target. The gun captain works to find ways of correlating his group so that extra salvos may be put in the air. The training of this crew takes months. Should some of these men become frequent visitors to the sick list the efficiency of the whole is gone.

In the second category the internist plays a very definite part, for here he must weed out the physically unfit before final acceptance. The well trained internist is of inestimable value in our Training Station organization.

It is needless for me to comment on the third group, as far as the duties of the internist are concerned. Here is his most active field. I will not say most useful, for it is difficult to decide where that margin really begins and ends. The problems that face the internist in the care of the sick are exactly the same as the problems that face you who are in civil practice. Because of this we constantly turn to you for aid and advice in helping to solve our problems. The Navy is especially grateful to the men who have helped to train our internists in the fields of cardiology, gastroenterology, and respiratory diseases.

I now come to the last group and this is the one where the problem of the internist in the Service and the internist in civil life diverge. When an officer or a man appears before a Board of Medical Survey to determine his fitness to continue on active duty in our Service, a number of problems present themselves:

1. Why is this man no longer fit to do active duty?

2. If he is no longer fit, then what part can he ever play in the Naval Service?

3. What disposition should the Navy make in this case?

4. How can he be properly rehabilitated so that he may find a useful spot outside the Service and secure as many years of life as possible?

One of the most distressing things that has come to our attention during the past 20 years is the apparent increase in coronary disease. We are making a study of the cardiac deaths that occurred in the Navy between the years of 1920 and 1930, and those that occurred between the years of 1930 and 1940. We are observing that the age incidence in these coronary deaths is lowering year by year. We also feel that the morbidity is much higher. Whether this is true or whether the diagnosis was missed in the earlier days is something we wish to discover. Are we crowding our officers to a point where the cardiovascular system can no longer care for its load? Are we piling on so much responsibility that the nervous system can not maintain its stability? These are problems that the internist must solve.

The management of a typical coronary case has a different aspect in the Naval Service. I grant freely that every coronary case that is properly handled should be able to assume some type of usefulness in the way of work. It is an absolute necessity that the individual be provided with some form of employment by which he can occupy his time. We have made a hard and fast rule among the officers that no one who has had a frank coronary attack can be returned to active duty. This may seem rather cruel and some of you may feel that we are wasting officer material by such a ruling. Consider then the responsibility that falls upon an officer, especially of the Line of the Navy. Speed is the essence of everything today. Our

ships go faster, our planes fly at increasing speeds. This means that the officer-in-command of Units, or a single Unit, must have all his faculties alert at all times.   I can leave to your imagination what would happen to a number of ships in column, traveling at a speed of thirty knots, should the Commander of this Division, or the Commanding Officer of a single ship, collapse at his station on the bridge at the time the command was passed to change the course of the formation.   It is for this reason that we can not allow an officer who has had one serious heart attack to assume these spots of great responsibility.

The cardiovascular case presents very much the same picture.   How much stress and strain should we allow the individual who has a damaged vascular system, or who is carrying a very high diastolic pressure?   How long should we permit this man to go before we call a halt and return him to civil life where he can be rehabilitated in a normal fashion?

The next group that gives the internist a great deal of cause for worry is the ulcer case.   A peptic, or a duodenal, ulcer is always a rather difficult case to handle, unless the individual can be hospitalized.   Consider then the difficulty the medical officer of a ship has in attempting to care for a definite case of duodenal ulcer, when the diet field is so thoroughly limited.   Life on board ship is certainly not conducive to ulcer repair.   The internist is called on to make the decision in these ulcer cases as to where the safety point lies, as far as the patient is concerned, and as to when he no longer can carry on his duties at sea.   This means separation from the active list of the Service.

Of course, we have many other conditions that give a great deal of cause for serious thought.   The field of the tuberculous individual is one of the most important.   In passing, I may say that we are roentgen-raying the chests of all men entering the Naval Service.   Upon their discharge the same will be done.   This I am sure you will agree is a step in the right direction in aiding to weed out the tuberculous individual.   It also protects the Government against many claims that might be without foundation, as was seen during World War times.

In the consideration of serious diseases, such as those due to endocrine imbalance, the question is always before the internist as to the proper means for carrying this individual along so that he may perform his duty efficiently. In some conditions, such as hypothyroidism, diabetes, or certain heart disorders that require, from time to time, digitalis, quinidine, or other special drugs, the proposition of always having the proper remedy on hand to make the individual efficient markedly lowers his usefulness to the Service. In other words, a man who has to depend upon a bottle of medicine for his efficiency can not be considered a top flight officer.   Still this individual in civil life can be carried on for many years in a reasonable state of health and can pursue his profession, or trade, with very little time on the sick list.

One subject that is coming in for a great deal of discussion these days is who should treat the various forms of syphilis.   The Navy has been criticized in the past for putting these cases in the genito-urinary Service.   We

are told that syphilis is a medical condition. Quite true it is. I think it is very possible that our medical services could easily care for the active luetic infection. There is a definite doubt in my mind as to the propriety of the internist treating the neurosyphilitic case. I am making no attempt today to pass a final word on this subject. I think it is one that is open to argument and we, in the Service, will be interested in receiving constructive recommendations. One of the most troublesome groups with which we have to deal is the luetic of long standing, or those cases in older age groups, when all efforts to find the focal point of infection are negative, and history avails nothing.

This brings up the subject of " Line of Duty " which is one of the most important that faces every officer and man when he enters upon the sick list. His retired pay or pension will depend upon his ability to establish his line of duty status. The doctor must serve in this additional regard. He must fairly judge his cases and see that no injustices are done and that no means are overlooked to aid the patients in clearing up delicate points which may mean everything to them in the future.

The mental misfits have long been a constant source of worry to our Service. We are planning to relieve the internist from this duty of attempting to segregate these unfortunates by having well trained psychiatrists and a few good psychologists attached to every Training Station.

You may now ask what we are going to do with the officers or men of years of service who have great ability and experience. Are their services to be completely thrown away and of no longer use to the Navy? So far as the active list is concerned, the answer is " Yes." In times of emergency, however, such as the one we are now in, we have adopted a system which is not unlike yours in civil life. We are recommending many of these old heart cases, and a certain number of the hypertensives, for spot jobs. By spot jobs I mean carefully selected duties where a man can give the Service the benefit of his experience in his specialty, without subjecting him to the stress and strain of high responsibility. We are also able to do this in a like manner with many of our retired enlisted personnel. We are attempting, however, not to order back to duty any retired officer or man whose disability is of such an extent or character that his return would light up his old condition and possibly bring about his death. At a time like this, of course, the nation and the Navy have the first call on Service personnel, whether active or retired, but one should never lose sight of the fact that the officer or man who has had long and honorable service should receive consideration. Surely we, as doctors, must consider the dependents of these men.

The internist in the Navy is given every opportunity as he goes along to increase his professional efficiency by postgraduate work in our civil institutions. It is the policy of the Bureau of Medicine and Surgery to be sure our internists attend as many of the clinics throughout this country as it is physically possible for them to do.

We are making every effort to open up research in many lines where we have the facilities and the experience with which to carry them out.   As you know, the Navy has done a great deal in the study of the effect of oxygen and helium in diving.   We are now turning this vast knowledge to the higher altitudes.   We find that we have bridged a great gap by this experimental work under high pressures and with the coöperation of many of our men in institutions in civil life, we hope to add a great deal to what a human being can do above the 35,000 foot level.

The field of industrial medicine is not being neglected.   Here again we are turning to civilian institutions for help in training more personnel for use in our industrial plants.

In this short review I have merely attempted to give you an idea of what the internist in the Navy must do in addition to treating his cases.   I do this realizing that in case of a complete mobilization many of you, who are not now in the Medical Reserve Corps of the Army or the Navy, will probably wish to join.   He who may come into our Service will find himself assigned to a department, where his specialty will make him extremely useful.   I can promise you an interesting and busy service which I am sure none of you will ever regret.   To you who may have your eyes on the horizon, we have our Mobile Hospitals which will be located on our far-flung islands.   There the problems of the various tropical diseases will confront you.   Or perhaps you might prefer duty on some of our Hospital Ships.   In any case, let me assure you that life will never be dull.   The Navy will be very glad to have the opportunity of your coöperation and active participation.

MEDICINE IN ENGLAND NOW *

By THOMAS PARRAN, F.A.C.P., SURGEON GENERAL, U. S. PUBLIC
HEALTH SERVICE, *Washington, D. C.*

MODERN science has extended the area and scope of medical defense against enemy action no less than it has extended the area and scope of war operations. The whole population of Great Britain is in the battle line. The whole medical profession is in the forefront of the battle. As a member of a Commission on Civil Defense, I spent the month of February in Great Britain. This commission was appointed by the Council of National Defense at the request of the General Staff of the Army. Military science has evolved through the centuries, engaging some of the best minds in every country in every age. In Great Britain during the past few years, there has been developed a new science of civil defense just as intricate, just as complicated in its organization and operation as military science. Yet there have been few guide posts, no trained personnel. It is commonly agreed that the system, especially in its medical aspects, accomplishes its purpose effectively, through an integration of governmental, professional and voluntary effort.

In planning civil defenses, the British made two major mistakes: 1. They assumed widespread and intensive raids immediately at the outset of the war with as many as 30,000 casualties a day needing hospital care. 2. They did not envision prolonged continuous night bombing necessitating the use of shelters as sleeping quarters.

To care for the expected casualties, they doubled the prewar complement of hospital beds throughout the country; by discharging convalescent patients; by evacuating mental hospitals, institutions for the feeble-minded, the aged, etc.; by constructing huts,—temporary wards frequently on the grounds of an existing hospital; by converting large estates into hospitals; and by " upgrading " existing institutions through the addition of operating theaters, the provision of nursing and surgical staffs, etc.

In preparation for war, the country was divided into 12 regions with a regional commissioner in charge and with representatives of each Ministry assigned to the commissioner. This decentralization provides independent self-governing areas in the event of invasion, or other enemy action which would disrupt communications. The public health, hospital and medical services are a part of the regional plan.

The war has brought large responsibilities to the Ministry of Health and to local health authorities. Under the Ministry, an Emergency Medical Service was organized. An important first step was a cataloguing of all hospitals in the country, voluntary and public. The use to which each should be put was decided.

* Read at the Boston meeting of the American College of Physicians, April 24, 1941.

The London area was recognized as a special case and its emergency hospital service was based upon ten sectors radiating fan-like from the center outward and extending well beyond the metropolitan area.   In each sector the hospitals are classified into Casualty Clearing Hospitals, Advance Base Hospitals, and Base Hospitals, and additional beds provided for each.

The Casualty Clearing Hospitals are near the center of London and other large cities.   A large proportion of regular patients were evacuated, especially from the top floors and glass cubicles.   In addition a specified number of beds in each are kept vacant for casualties.

The Advance Base Hospitals usually are located 15 to 30 miles from the center of the city.   The average capacity is 1,000 to 2,000 beds.   Patients are admitted to these hospitals from the Casualty Clearing Hospitals or occasionally directly from first aid posts.

Base Hospitals are located 60 to 100 miles out, and have 1,000 to 3,000 beds.   Patients admitted to these have been classified into specialty groups, —orthopedic, maxillo-facial, neurosurgical, eye, etc.

The Emergency Medical Service pays the voluntary hospitals £3 per week per bed reserved for casualties.   When occupied, the rate is £4 per week. Due to the lack of casualties, this has proved a boon to the voluntary hospital budgets.

It should be emphasized that there is in Great Britain now essentially one integrated national hospital service for civilian and military casualties. There are no separate base hospitals for the Army.   Since this whole system has been scrambled together, the British doubt that it ever will be completely unscrambled.

The first-aid posts were organized by the municipal or county health authorities under standards proposed by the Ministry.   In general the cost of ambulances and of the whole air-raid precaution service is reimbursed by the central government.   To train the first-aid teams has been a major task. The need for additional nurses has been met by training more than 120,000 nursing aids and auxiliaries.

While total war creates a demand for many skills, the skill in which there is the greatest shortage is that of the doctor.   Four days ago, the President responded to the urgent request of the British Red Cross for American doctors.   He said: " To any American doctor who is eligible and able to do service, this cause presents a splendid opportunity."   Assurance that medical aid is promptly available to all casualties is an important consideration in maintaining morale.   Day and night in every operating theater, a surgical team stands by.   A doctor is on call or working in every first-aid post. Each night a doctor visits all large shelters.   Moreover a modern army requires many doctors, especially in mobile mechanized warfare.   Doctors are needed too in the large factories and to supply the needs of an expanded Navy and Air Corps.   Up to now epidemics have been held in check.   Air raid casualties have been fewer than anticipated and have received prompt

THOMAS PARRAN

attention.   To accomplish these results, however, the British doctors have been under a severe strain and medical services for the general population have been diluted.   Britain's appeal to the American Red Cross for at least 1,000 of our young doctors is a great opportunity for us to meet a real need. Aside from its humane aspects, American doctors, working side by side with British surgeons and physicians, will acquire valuable experience in the medical technic of modern warfare.   Those who answer this Red Cross appeal will not only have rare professional opportunities but will also have the satisfaction of giving help where it is sorely needed.   I feel certain America's doctors will answer this call.   The needs are great, the rewards will be greater.

The British have been very intelligent in using their medical resources to the best advantage.   No medical or dental student is allowed to volunteer and he is not drafted if he passes his examinations from term to term in an accredited school.   This deferment is not a " hiding hole " for slackers. Every such student upon graduation or after one or two 6-month periods of internship is automatically called to service for the duration.

When the system of the Emergency Medical Service hospitals was established, they were staffed by doctors of all ages who were, in effect, requisitioned from civil practice.   In London, for example, the staffs of the teaching hospitals located near the center of the city were dispersed to the peripheral hospitals.   The regional, sector, and group hospital officers who themselves had been drawn largely from the staffs of voluntary hospitals, decided who would go to the peripheral base hospitals and who would stay at home. With rare exceptions the assignments were considered as orders.   For example, a large proportion of the specialists in Harley Street with expensive practices and equally expensive offices and other commitments, were recruited for full-time service at a standard pay of £800 per year.   They abandoned their practices, moved 50 to 100 miles to a base hospital and stood by waiting for patients.   No casualties appeared during the early months of the war. Naturally some of them drifted back to their accustomed practice.   Recognizing the situation, the Emergency Medical Service gave these doctors the choice of continuing on a full-time basis or of rendering a part-time service; subject to call at a lower pay (£300 per year), but with the understanding that if enemy action increased and the government required their services full-time, such services would be given at the same part-time rate.   Most of the doctors accepted the offers, leaving skeleton staffs, mostly junior men, at the peripheral hospitals.   When the heavy blitz started in September 1940, the full-time service of additional doctors was required in the peripheral hospitals and the financial arrangement was readjusted.

Prior to the war there was perfected a medical war organization for the country.   At the head was a Central Medical War Committee, composed of the leading physicians, members of the British Medical Association.   The Secretary of the Committee is the Secretary of the British Medical Associa-

tion. To this committee was given the task of registering every doctor and every medical student in the country.

Whenever the military forces requisitioned a quota of doctors, the Central Medical War Committee allocated the quota to the various communities in Great Britain in proportion to the number of doctors still remaining as related to the population. When the quota is sent to the civil subdivision (county, city, etc.) a local medical war committee, made up of senior doctors, selects the persons who can most easily be spared from present tasks. Doctors in health departments and in important hospital positions are not disturbed. Younger doctors are given preference for service. When a doctor is selected by the local medical war committee he responds in nine cases out of ten. The exceptional doctor may ask for deferment because of some determining personal consideration. His appeal is reviewed. If the decision is not in his favor, he has the right of appeal officially to the Central War Committee in London. Ordinarily, financial considerations are given scant attention.

If we are to learn anything from the British experience on the medical front, we must reorganize our approach to the problem of medicine's contribution to the defense effort. The medical needs of the civilian population should be considered in all recruitment plans, and should be balanced against the military needs. The Health and Medical Committee, Council of National Defense, or a comparable group should be given responsibility for broad national planning. Medical personnel for military, industrial and civilian health and medical services should be recruited on a quota basis, having in mind the service which each individual physician can render best. Volunteers should not be accepted if they are doing a more essential civilian job. The objective should be to see that each doctor is doing the task for which he is best fitted.

Under a national medical committee, there should be similar committees on medical personnel in each State and in each of the larger communities. These State and local committees made up of senior doctors should decide who should join the services and who should remain at home.

All medical and dental students enrolled, all students accepted for admission and those completing their courses satisfactorily in accredited medical and dental schools should not be drafted until graduation and the completion of an internship, after which those who are physically fit should be required to render a period of service to the government.

The successful local organization of medical defense efforts in Great Britain was possible because for two decades or more, Britain has had a nucleus of trained medical officers of health. Without this nucleus, effective local medical defenses could not have been organized. We should take steps promptly to double the number of doctors with training and experience in public health and medical administration. In addition, there should be a comparable increase in public health nurses, sanitary engineers,

sanitary inspectors, laboratory technicians and other technical public health personnel. New training centers will be needed for the training of key persons who in turn will train others who will work under supervision in local communities.

Central planning for medical aspects of civil defense should be done. This should include the survey of existing hospital facilities, area by area, and of those structures which can be converted to hospital use. Estimates should be made as to additional hospital beds needed, area by area. The number and location of the beds will depend upon the position of the area in reference to vulnerability to enemy action.

This is not the occasion for a comprehensive outline of all needed steps. Nevertheless, we should make our plans now, on a national scale. There is no time for planning when the enemy strikes. Among other things our plans should include provision of additional operating theaters and their protection against enemy action; the protection of existing hospitals; the consideration of safety from air attack in new hospital construction, the number, location and equipment of first-aid posts, the provision of ambulances of a standard type with standard fitments, and the earmarking of commercial vehicles for emergency ambulance service, the planning of decontamination centers and training of key personnel in each vulnerable area in anti-gas warfare. I am not recommending all of the above for the whole country but for those areas designated by competent military authorities as vulnerable to enemy action. In addition, special mobile staffs trained in medical defense measures should be available to aid in the organization of such civil defense measures in our Territories and possessions and in those areas which we are committed to defend.

It should be emphasized that in the midst of war, the British have not curtailed but have extended their social insurance and other social laws, and have adapted them to war needs.

Finally, let me say that we doctors in the United States should be inspired by the example of our British medical colleagues. In the midst of war they are planning for the peace. The British Medical Association has set up a Medical Planning Commission to " study war-time developments and their effects on the country's medical services, both present and future." In an editorial comment the British Medical Journal points out that the war has thrown into sharp relief the deficiencies of their peace-time system of administering relief to the sick and of promoting and maintaining the health of the people. " The British Medical Association now proposes to prepare for the return of peace so that medicine may be ready to meet its responsibilities in a world in which many values will be changed, fresh conceptions of society will be formed, and in which new stresses and strains will appear in the moral, material, and economic fabric of the democracy we hold to be our rightful heritage."

I have every confidence that medicine in America will meet whatever demands the future may impose, whether of war or of peace.

NUTRITION IN THE UNITED STATES: A PROGRAM FOR THE PRESENT EMERGENCY AND THE FUTURE *

By RUSSELL M. WILDER, M.D., F.A.C.P., *Rochester, Minnesota*

THAT the present emergency calls for a great increase in the size of our Army and Navy with provision of all that is necessary to make these armed forces into a superlative instrument of war, scarcely anyone denies. That it calls for rapid acceleration of those of our industries which can engage in the manufacture of materials of war, everyone will grant. That to accomplish what needs to be done will entail sacrifice on the part of almost everyone, and longer and more arduous work for many, will be acknowledged. These are self-evident truths. On them, however, is based my concern, and that of every thoughtful student of nutrition, with the existing degree of malnutrition, because controlled experimentation has taught us that willingness to sacrifice and to work, as well as the determination and courage, necessary not only in the Army but in those behind the lines, are human qualities that weaken when foods fail to provide what is needed for satisfactory nutrition.

That many American diets are deficient in quality, deficient especially in those chemical catalysts, the vitamins, which activate human energies as spark plugs activate machines, is a conclusion based on highly qualified medical advice, that of Drs. Jolliffe, McLester, Spies, Sydenstricker, Tisdall, and many other physicians who, because of large experience with deficiency disease, possess the rather special training necessary to recognize the widespread prevalence of submarginal degrees of deficiency disease. It is based also on many recent nutritional surveys including the extensive governmental studies of consumer purchases conducted by the Bureau of Labor Statistics, the Bureau of Home Economics, and the National Resources Committee.

The English, faced with a very similar problem, are taking vigorous steps to combat it. Dr. Geoffrey Bourne has written of this in his book, " Nutrition and War." That millions of people should live on or below the borderline of minimum nutrition is a special danger in time of war. Such persons not only are unable to work effectively, but also they succumb easily to infectious diseases and offer a breeding ground for such pandemics as the influenza of World War I.

The necessity for action on the nutrition front is no less pressing than that for mobilizing physical equipment, and the time element is equally im-

portant. It will take months and even years to gear up the industrial facilities for making the required tanks, planes and ships. It will require as many months or years to gear up the manpower of the nation to run the accelerated machinery. Fortunately, through the foresight of the head of the Consumer Division of the National Defense Advisory Commission, an early start was made. The leadership now is provided by Governor McNutt, Director M. L. Wilson, and Surgeon General Parran. The scientific guidance is in the hands of the nutritional experts, in government and out, of the Committee on Food and Nutrition of the National Research Council. This campaign soon will be intensified. It must have the fullest possible support or the consequences may be disastrous. Without strong human defenses, military defenses fail.

The Need for Better Nutrition Not Limited to This Emergency

One permanent good at least seems likely to emerge from the present defense activities. The recognition which nutritional science must now receive comes none too soon. Entirely apart from the present emergency, the nutritional situation is a cause for grave concern. It presents, indeed, a public health problem of major importance. One sometimes hears men say, however, that our food habits are no worse than they were before we ever heard of vitamins; no worse, these persons say, than during the first World War, which we fought effectively.

Actually our food ways for some 60 years have been worse than at any previous time in history. They are worse today than they were in 1914, for the reason that more years have passed since certain detrimental changes were made, some 60 years ago, in the food habits of our population.

Those who have had training in biology appreciate that changes in nutritional environment are badly borne by all organisms from bacteria to mammals. A changed nutritional environment in the case of vertebrates and other higher animals means changes in the constituents of blood and lymph; in other words, changes in the " milieu interne," so called by Claude Bernard. Adjustments to changes of the milieu interne are difficult. We adjust better to external temperatures, for instance, than to equal alterations of the temperatures within the body. We can immerse our bodies in the ocean, but would perish promptly if our blood contained as much salt as ocean water.

Adjustments to changes in the blood and lymph are possible, but require generations for their accomplishment. I have no doubt that given several thousand years the human race might learn to live efficiently on a third or a fourth the amount of thiamine (vitamin B_1) which its ancestors got and came to depend on. Also, the human race might learn to do without ascorbic acid (vitamin C), as rats apparently have learned to do. But in the learning countless individuals would be sacrificed and for a long period succeeding generations would deteriorate.

A changed nutritional environment of major degree is intolerable. One of a minor degree may be appreciated with difficulty and make itself felt only from one generation to the next. This is readily shown with laboratory animals. It is more difficult to trace in the case of human beings. Although not established by sufficient proof, there is reason to believe that a relationship exists between the increasing incidences of several of the so-called degenerative diseases and the great change in our food ways which, as I have said, occurred about 1880. I have in mind arteriosclerosis, diabetes, some forms of arthritis, and some insanities.

You will be wondering now about this change in food ways, and for more details I must refer you to the fascinating book " The American and His Food " by Professor Richard O. Cummings. Of major significance was the introduction of modern methods for milling wheat and refining sugar. We did to wheat what the Chinese did to rice, i.e., milled out of it and discarded or fed to swine and cattle much of the good in it. Even worse than this we replaced about half the wheat our ancestors ate with refined sugar, than which there probably is no food less satisfactory from the standpoint of nutrition. In consequence the average American diet of today, even in families with liberal money expenditures for food, contains only about a third as much thiamine as in Civil War times. And with the thiamine has gone a quota of many other nutritional substances, other vitamins and minerals. The nutritional loss from this replacement of the undermilled flour of the past with white flour and sugar has been compensated for, to a certain extent, by a greater consumption of garden vegetables and milk. Unfortunately neither garden vegetables nor milk provide thiamine as generously as does wheat. They are poorer, perhaps, in some of the other vitamins and minerals found in wheat. They also are more costly, at least for the city dweller, and so have gone mostly to families in upper income groups, leaving grave vitamin starvation among our poorer families.

In a nutrition laboratory at the Mayo Clinic, Dr. Williams, with Dr. Mason and other associates, has been studying volunteer subjects who are given diets made adequate in all respects except in thiamine. The scientific control is rigid. The food is analyzed for thiamine by Dr. Mason, and a double check is obtained by periodic analyses of excretions. The allowance of thiamine is regulated and changes in dosage are made without the knowledge of the subjects. In the course of such induced thiamine deficiency studies we have frequently seen cheerful, happy, vigorous, industrious young women become morose, depressed, fearful, irritable, uncoöperative and slovenly in personal appearance. They lack the strength to work and any interest in working. It is equally phenomenal to see these same young women return to their normal selves when the intake of thiamine again is raised to an adequate level, but the longer the deficiency continues the more difficult it is to restore these subjects. From this, one wonders whether continued deficiency of the thiamine content of American diets may not have led to a certain degree of irremediable deterioration.

Physicians until lately have been thinking of nutrition too much in terms of frank deficiency disease. A few persons die of beriberi in this country, but even before it was learned that nicotinic acid could be curative in pellagra, the number of deaths from pellagra recorded in any single year did not exceed a few thousand. The milder degrees of nutritional deficiency are the nub of the nutritional problem. Williams' experiments at the Mayo Clinic show that a man can subsist on as little as 0.6 mg. of thiamine a day, but that with this small intake he is only half alive. To function efficiently, to do the things that must be done now, he needs at least twice this amount, and for a safety factor at least 2 mg. How many men get 2 mg. of thiamine a day? Not more than half, probably fewer than a third, of the adult male population of the country.

Using sugar in the amounts we use it, and depending on plain white flour as we have done, thiamine, nicotinic acid and riboflavin are among the vitamins most likely to be inadequately represented in American diets. That is the reason for the recommendation of the Committee on Food and Nutrition of the National Research Council for putting these particular vitamins into enriched flour and enriched bread; that, as well as the fact that these three vitamins are involved in the oxidative changes whereby energy in the body is released from sugar. The more starch the diet contains, the greater the need for thiamine, nicotinic acid and riboflavin.

I may have emphasized disproportionately the deleterious effects of the introduction of white flour and refined sugar. Other serious faults exist in American diets. In some regions of the United States, and by some families everywhere, too little protein is obtained. In many of our poorer families lard is used instead of butter, and in their diets vitamin A is frequently wanting. In other diets, fruits are lacking and vitamin C is missed. In many diets, calcium is lacking in adequate amounts. It is difficult to get enough calcium without drinking milk, and many people don't like milk.

PLANNING FOR BETTER NUTRITION

What then needs most to be done? The problem involves economics, but economics cannot be changed rapidly. Half of the people in this country have less than 25 cents a day to spend for food, but even if the average income of the economically lower half of the population could be doubled, an amount of malnutrition, because of bad food habits, would still remain. Food habits are correctable, but to change them requires years of patient endeavor. Education will help much. The present nutritional program contemplates extensive use of education and this must be extended as much as possible. However, the learning capacity of many people is limited. The amount of training given the average citizen cannot well extend beyond teaching him appreciation of the nutritive values of vegetables, fruits, meats and dairy products. In the country the success of education will be greater, because many of these so-called protective foods can be grown in the garden,

and poultry and milk can be had economically. In the cities, unfortunately, the protective foods are beyond the means of many families or unattainable in sufficient quantities.

The educational program also encounters the obstacle that most people do not care to think too much about their choice of foods. I have frequently noted that even nutritional scientists pay little heed to what they eat; indeed, I must confess to some shortcomings in this respect myself.

Professor J. C. Drummond of London University has protested against the shibboleth that nutritional security can be found in what is vaguely called a mixed diet—that in such a diet one food can be depended on to compensate for the inadequacies of another. There is no such security today for the reason that more than two-thirds of the calories of diets come in the form of sugar, plain white flour, and processed fats. In such circumstances it is almost hopeless to expect the remaining third of the calories to carry all that is required of vitamins and minerals. Dr. Lydia Roberts frequently has made this comment.

IMPROVING STAPLE FOODS

What needs to be done if we are to have good diets everywhere is to make every food carry an appropriate share of some part of the responsibility for an adequate daily supply of all the nutritive essentials. Could that be done people would find themselves always surrounded by protective foods and in such favorable surroundings a mixed diet *would* provide security.

Alternatives to such a procedure can be thought of. We could try, for instance, to provide everyone with vitamins in capsules or tablets, or as has been suggested, with a supplementary food composed of wheat germ, dried yeast and other vitamin concentrates. The objection to these alternatives is psychologic. Most people don't like taking medicine and won't take capsules or tablets, at any rate not for long. The vitamin capsule, even if it could be compounded to provide all that was needed, which is a doubtful possibility, would be neglected. The supplementary food would encounter consumer resistance. People are as choosey with their breakfast cereals as with their brands of cigarettes, and to concoct a supplementary food to suit the taste of everybody presents a practical impossibility. Vitamin capsules and supplementary highly fortified foods have a place of importance in restricted fields, but much more likely to succeed in any nationwide attack on malnutrition is a program based on assuring the nutritive quality of all foods, with special attention to the inexpensive staples.

There are two ways to accomplish improvement of staple foods. Perhaps in time people can be persuaded to eat only natural foods, unprocessed food. The idea dates from Sylvester Graham. However, the virtues of natural foods have been extolled for a hundred years since Graham's time and the results are disappointing. Much good has come from nutritional education, but far from enough to solve the national need for better food.

Legislative prohibition of processed foods also probably would fail. Such a procedure is not the democratic way, and the net result would be a return of the bootlegger. Also the vested interests aroused would be gargantuan, and in practice any such procedure would create enormous difficulties of transportation and distribution. The costs of food would rise. The natural foods are perishable and perforce expensive.

Fortunately another way exists, one that will not conflict with popular tastes or seriously disturb investments of industry in plants and equipment, a way by which the advantages of food processing may be retained and disadvantages corrected. The food processor until recently has devoted his attention to securing a product pleasing to eye and taste. He has not been concerned with nutritive values. He knew little or nothing about such values, but he now is ready to learn and is prepared to act.

Enriching Flour and Bread

A start already has been made with flour and bread. Plain white flours and plain white breads are being enriched with thiamine, nicotinic acid, riboflavin and iron, according to the recommendations of the Committee on Food and Nutrition of the National Research Council. As the other factors of the vitamin B complex become available inexpensively, they too may be included in the specifications for these products, and as methods of milling develop which permit retaining the vitamins and minerals in white or creamy flours, their use will provide not only thiamine, nicotinic acid, riboflavin and iron, but the other nutritive constituents found in wheat. The reason for the emphasis on content of thiamine, nicotinic acid and riboflavin is the knowledge we now possess that these three vitamins are specifically concerned in the oxidative reactions in the body by means of which we liberate the energy in the sugar that comes from starchy foods like flour.

The reason for the emphasis on having a white or at most a creamy colored flour is that most persons don't like brown bread and those who eat brown bread do not, as a rule, use whole wheat flour in their cakes and pastries or in their gravies and sauces. To get the vitamins needed for the effective utilization of the starch of flour, not only flour used in bread but flour used for all purposes should contain them.

Furthermore, the brown bread that most brown bread eaters buy is made of part white flour and is only partly graham. The brown bread eaters recall the cold bath takers. The benefit they get impresses me as being mostly a feeling of righteousness. Also, as physicians we know from much clinical experience that bran flakes are not well tolerated by many persons. Brown and gray breads won't do for such persons. They are disliked by others, and for these reasons the dark loaf cannot be expected to compete successfully with the white where both brown and white loaves are available.

What little opposition thus far has come to the recommended program for enriching flour and bread is mostly from those who hold as a matter of

principle that " the good is really the enemy of the best." Most of us believe it is " better to make this compromise than to let the people suffer from vitamin starvation, perhaps for years." *

EDIBLE FATS SHOULD BE IMPROVED

Edible fats must soon receive attention. Just as products of wheat supplied mankind for untold generations with the water soluble vitamins of the B complex, so butter, cream and organ meats like liver and bone marrow provided him with much of what he needed of the fat soluble vitamins, especially vitamin A and vitamin D. Less recently than in the case of wheat a change took place in this arrangement. Milk production became an industry, and cows fed on winter fodder yield milk with butter fat less rich in vitamins. Also, in place of butter margarine was developed. At first it was made of fats of animal origin, later to a large extent from vegetable oils. In neither of these products does the content of vitamin A approach that of butter. Vitamin A can be synthesized in the human organism, as in the cow's, from carotene, and plenty of greens in the diet in most cases will provide what carotene is needed. Greens, however, are expensive for city dwellers, and infants and very young children cannot well take greens or do not do so. The story of how Danish children lost their eyes during the last war because the Danes, tempted by high prices, sold their butter to the Germans has been frequently recounted. Since then fortification of margarine with vitamins A and D has been made compulsory in Denmark by legislation.

Last year in the United States not more than 100 million of the 400 million pounds of margarine were fortified, and by regulation no margarine containing any animal fat could be thus improved. That regulation now, by an order of the chief of the Bureau of Animal Industry, has been suspended. It seems to me probable that we shall go further than this. We certainly must recommend that butter and margarine which contain an approved amount of vitamin A and vitamin D be preferred to other butter or margarine, but also because many persons use lard as a substitute for butter I would like to see all lard with a fixed added content of these vitamins. The expense would be insignificant. The benefit among the poor would be enormous. The prevalence of night blindness in England is said to be revealed by an increasing number of " blackout " accidents and deaths.

THE MILK PROBLEM

Improving staple foods need not, and indeed should not, be limited to additions of vitamin concentrates or synthetics. The distribution of milk as this now is practiced is wasteful. Much of the production is never brought to the market, and many who need milk most cannot afford to get it. Remove the fat from a quart of whole milk costing the consumer ten

* The quotation is from the answer by Bruce Bliven to a letter in the Countryman, England (New Republic, March 24, 1941, p. 407).

cents or more, sell it as butter or cream to those who can afford to buy butter and cream, and in the skim milk solids that remain you have another product which being more or less imperishable could be distributed for a cent or two, a tenth the cost of fluid milk. Of all the valuable nutritives contained in milk, by far the greater number remain in the skim milk solids. In this sense skim milk solids represent the best part of milk. They are a good food source of calcium, and more diets probably are deficient in calcium than in any other food essential. Also in milk and remaining in the skim milk solids are all of the water soluble vitamins and the most perfect proteins known, casein and lactalbumin.

But how can universal use of skim milk solids be obtained? This problem now is receiving attention in the nutritional program. At present much skim milk is wasted or used uneconomically in feed for swine and poultry. A solution I have to propose would provide an answer not only to this problem, but to another, that of sugar.

THE SUGAR PROBLEM

The daily consumption of sugar in the United States, most of it refined sugar, averages per capita approximately five and one-half ounces. The addition to the diet of this material, representing more than 600 calories, or a fourth of all the calories of the diet, and carrying no vitamins and no minerals, is a major nutritional error. Nutritionists agree that of all foods, sugar unquestionably is the worst. Yet the public demands sugar because of its sweetness. Also the public wants its sugar white. To believe otherwise involves wishful thinking and is unrealistic. Brown sugar cannot compete in the national market with white sugar, nor can sorgum or molasses. Some samples of molasses are rich in vitamins, others are not, and much brown sugar and molasses contain material that is undesirable.

Our country literally is a land flowing with milk and honey, but the milk, as I have said, is largely unconsumed, and the honey is in the form of refined sugar. Why not ask the sugar to carry the milk, and thereby provide sugar with the vitamins necessary to make its energy effective? Were each average daily per capita portion of sugar (five and one-half ounces) to be combined with only a little more than an ounce of skim milk solids, we should improve the American diet to the extent of including in it the equivalent of a pint of skim milk. For most cooking purposes the presence of 22 per cent of skim milk solids in sugar would be advantageous rather than otherwise. I can foresee objections from soda pop fanciers and those who like their liquors clear. The answer for them might be to use whey solids. Whey will go into a fairly clear solution. Whey represents the milk less casein. The lactalbumin, which contains all the biologically necessary amino-acids, remains, as does most of the content of minerals and water soluble vitamins. Whey is produced in enormous quantities as a by-product in the manufacture of cheese, and although some of it finds a market in poultry feed, it mostly today is not used for any purpose.

Ascorbic Acid (Vitamin C)

Were all flour to be " enriched " as now is recommended, were all edible fats to be fortified with vitamins A and D to reasonable limits, and if little more than an ounce of the solids of milk or whey could be incorporated in everybody's diet, thiamine, riboflavin, nicotinic acid, iron, calcium, vitamin A, vitamin D, and at least a minimal quota of all the biologically necessary amino-acids would be automatically provided.* Remaining for attention is ascorbic acid, the antiscurvy vitamin, vitamin C. If we can also arrange for its supply we shall have corrected, in all probability, the dietary deficiencies which mainly confront us. There may be other factors to think about later, but proof of their significance in human nutrition, or for their absence from even poor American diets, is not in the evidence today. In any case, as soon as the millers have learned how to mill a white flour which retains all the nutrients of wheat grain, we shall have no need to worry about other factors. They will be found in such flour.

Vitamin C, ascorbic acid, however, remains a problem. It is an old problem. Scurvy is said to have dogged the Crusaders. It is thought to have contributed more than anything else to the failure of the Vikings to colonize America. Directly, or indirectly, by predisposing to infections, scurvy has caused more loss of life in past wars than all the engines of war combined. It is said to have hastened the tragedy of the siege of Kut, to have weakened the British at Gallipoli in 1918, and to have contributed importantly to the collapse of Germany. Forewarned by this experience the Germans are said to have built up a huge reserve of synthetic ascorbic acid for this war.

Ascorbic acid is sensitive to oxidation. It cannot be heated without great loss and for this reason is little suited for fortification of any staple food. However, we have in our country vast supplies of citrus fruits and an abundance of tomatoes, all very acceptable to consumers. The problem is one of distribution. Subsidy may be necessary. Economies probably could be effected by suitable processing of the juices. Also, potatoes are a fair source of this important substance, and potatoes are abundant and inexpensive.

The Science of Nutrition an Instrument of Social Policy

A program such as that proposed would create the nutritional environment desired, in which to go wrong in nutrition would be difficult. The inexpensive staple foods which everybody eats would provide at least a minimal requirement of all the vitamins, minerals and amino-acids, and the balance then would easily be secured from whatever other foods were chosen to complete the diet.

* More iodine is needed in goiter regions, the states bordering on the Great Lakes and some mountain states. An adequate supply can be obtained by using iodized salt (one part sodium or potassium iodide to 5000 parts salt). Use of such salt has long been recommended by the Council on Foods and Nutrition of the American Medical Association.

The program, instead of provoking the opposition of the industries affected, should win their wholehearted coöperation, as it has in the case of the millers and bakers.   Food habits, so difficult to change, should interfere scarcely at all.   We still would have white flour, white bread, white sugar, margarine, and lard, but these would be good flour, good bread, good sugar and good fat.   Malnutrition in such circumstances should vanish as a public problem, and with it undoubtedly would go much other disease.

The day has come when the science of nutrition must be recognized as an instrument of social policy.   To put existing knowledge of nutrition to work is a duty, now, and with willingness on the part of government to co-operate with science and industry, enlightened procedure by industry and vigorous leadership by those who have influence on public opinion this will be done.

THE CONCENTRATION OF ARSENIC IN TISSUES AND THE EXCRETION OF ARSENIC BY EX-PERIMENTAL ANIMALS FOLLOWING INTRAVENOUS INJECTION OF MASSIVE DOSES OF MAPHARSEN *

By Harold J. Magnuson, M.D.,† and B. O. Raulston, M.D., F.A.C.P.,
Los Angeles, California

The use of massive doses of arsenicals, given by the intravenous drip method, in the treatment of syphilis by Hyman, Chargin, Leifer and their co-workers [1] has stimulated renewed interest and effort directed toward improvement of the generally accepted plans for treatment of this disease. The advantages of reducing the time during which treatment must be continued consecutively and of rapidly stopping the possibility of spreading the disease are self evident. The need of information concerning the distribution of arsenic in the body following injection of large amounts within short periods is conspicuous. The relationship between concentrations of arsenic and its spirochetocidal effect, and its toxic effect upon various tissues should be determined.

The experiments, upon which this report is based, were undertaken for the purpose of repeating as nearly as possible in dogs the treatment used and described by the authors mentioned above. Arsenoxide ("mapharsen") was given in amounts comparable to those used in the treatment of patients by Hyman et al. The amount of arsenic excreted in the urine and feces, and the concentrations in the blood were determined during the experiment. Animals were sacrificed at various stages of the injections, concentration of arsenic in tissues determined and histological studies of numerous tissues made.

Adult male dogs weighing between 8 and 33 kilograms were used. The animals were fed a diet of canned dog food and given as much water as desired during the times when they were not actually receiving the injections of mapharsen.

During the intravenous injections it was necessary to have the dogs under nembutal anesthesia which at all times was as light as possible. All injections were made into the external jugular veins. For one half hour mapharsen dissolved in 5 per cent glucose was given, followed by 5 per cent glucose alone for one hour. This was repeated for a total of 10 times during the day. The rate of flow was such that the animal received 50 c.c. of fluid

per hour. The dosage of mapharsen was 0.4 mg. per kilogram of body weight per hour and one half. A full course of treatment consisted of ten such doses daily for four days. Thus a dog at the end of four days would have received 16 mg. of mapharsen per kilogram of body weight, which is the equivalent of giving a man of 60 kilograms a total of 960 mg. of mapharsen.

Urine was collected through a retention catheter. All feces were saved for arsenic determinations. Blood and urine specimens for arsenic determinations were taken before each day's injection started and just before the fourth, seventh, and tenth mapharsen doses of each day. In some cases
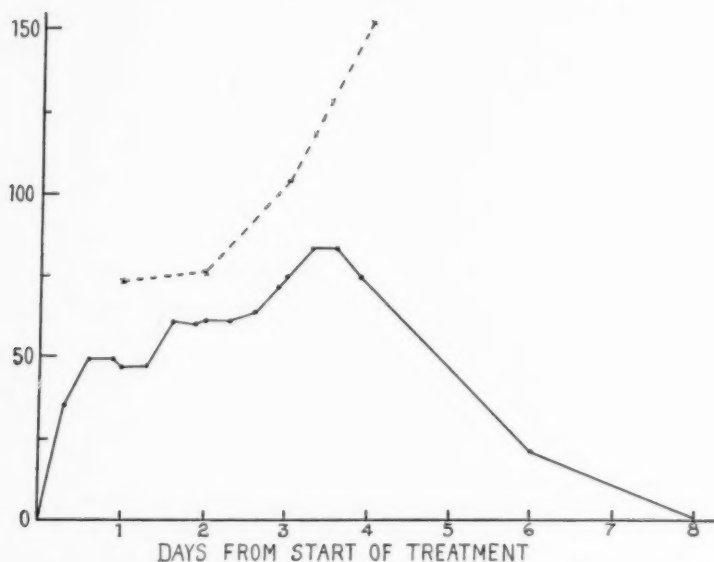
FIG. 1. Whole blood arsenic micrograms per 100 c.c. Solid line = one hour after mapharsen; broken line = one half hour after mapharsen.

specimens were taken one half hour after the finish of the last mapharsen of the day.

Animals were sacrificed at the end of one, two, three, and four days of treatment, and four, eight, and sixteen days following four days' treatment. When sacrificed at the end of a day's treatment, the animals were killed one hour after the start of the last mapharsen injection so that they received glucose alone for one half hour after the last injection of arsenic had been finished. Animals were sacrificed by increasing the anesthetic, and cutting the aorta just distal to the renal arteries so that as much blood as possible would be removed from the tissues.

Whenever possible duplicate specimens of tissue were taken for arsenic determinations, which were done by the method of Chaney and Magnuson.[2] Blocks for histological examination were fixed in Zenker's solution.

Eighteen animals were used in all, but complete analyses are available on but nine. Two animals died from overdosage of anesthetic at the end of five and of seven injections of arsenic. One dog, sacrificed on the third day of treatment, was found to have pneumonia. In view of the suggestion that fever be employed with this form of therapy, it is interesting to note that this dog had much higher concentrations of arsenic in nearly all his tissues than any other animal treated in this study. Three animals that received neoarsphenamine, one that received a small dosage of mapharsen, and two animals used in the first part of the experiment on whom technical difficulties in analysis were encountered, are not included. One animal was given glucose and anesthetic only and was used as a control.

The nine animals on which complete analyses are available are divided as follows: one each for the control, one, two, three and four days of treatment and for four and sixteen days following treatment and two for eight days following treatment.
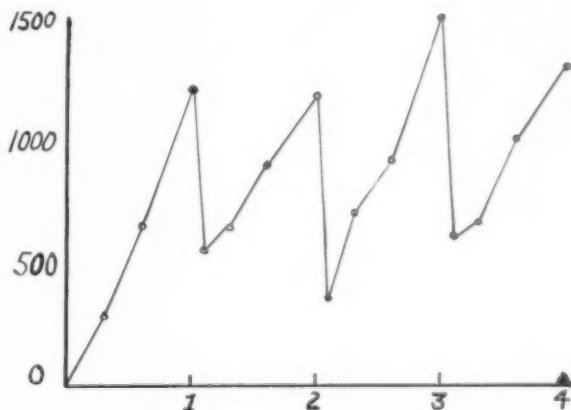
FIG. 2. Urinary excretion. Micrograms per 10 kg. body weight.

The amount of arsenic in micrograms per 100 c.c. found in whole blood is indicated in figure 1. The solid line represents samples taken just before the next dose of mapharsen was to be started. These values should represent the lowest level of arsenic during that particular time period. The values on the broken line represent samples taken at the end of the day one half hour after the finish of the last dose of mapharsen. It may be seen that these values are considerably higher than the minimum blood values. Attention should be called to the fact that during the eight hour night period when no arsenic was administered the blood arsenic failed to drop below the value obtained only an hour after the ninth dose of the previous day. Even two days after cessation of treatment the whole blood was found to contain approximately 20 micrograms of arsenic per 100 c.c.

The amount of arsenic excreted in the urine in micrograms per 10 kilograms of body weight is represented in figure 2. Unfortunately on some

occasions urine was lost during the night, and facilities were not available for the collection of urine following the four day injection period. It may be seen that the excretion increases during the day and that the total excretion increases from day to day. Expressed as percentage of the total amount of arsenic given to the end of that day the urinary excretion was as follows:

	Day			
	1	2	3	4
Per cent of arsenic given	18.8	24.5	27.3	27.9

There appears to be a slight lag in the excretion, though this may be more apparent than real as the night urine is included with that of the following day.
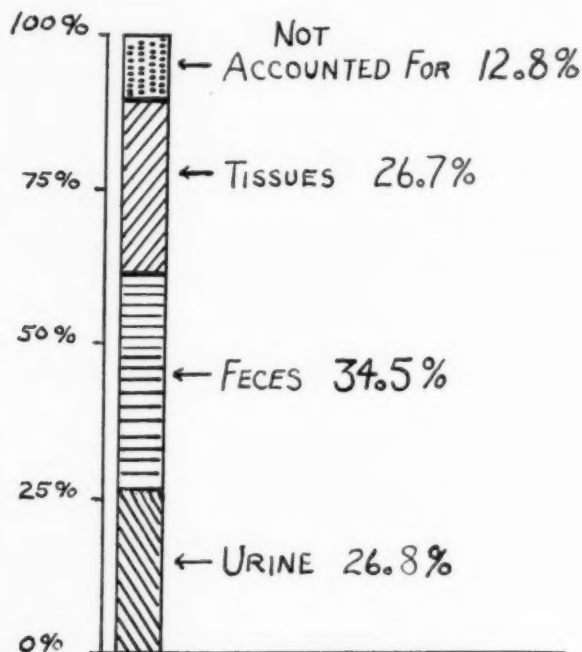
FIG. 3.   Fate of arsenic in four day dog.

The amount of arsenic excreted and the distribution of that retained in the body of an animal that had received injection during each of four successive days, is indicated in figure 3. The amounts in the tissues are based upon the actual weights of the parenchymatous organs, with the weight of the muscles and bones estimated at 50 per cent and 25 per cent, respectively, of the total body weight. The amount unaccounted for probably represents tissues

ARSENIC IN MICROGRAMS
PER 100 GMS. FRESH TISSUE

Fig. 4.

ARSENIC IN MICROGRAMS
PER 100 GRAMS TISSUE
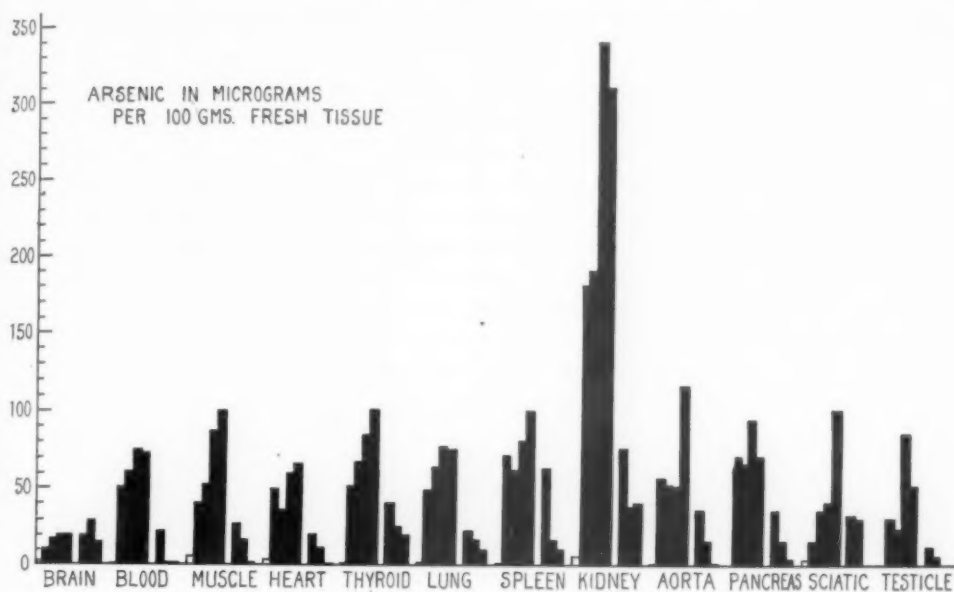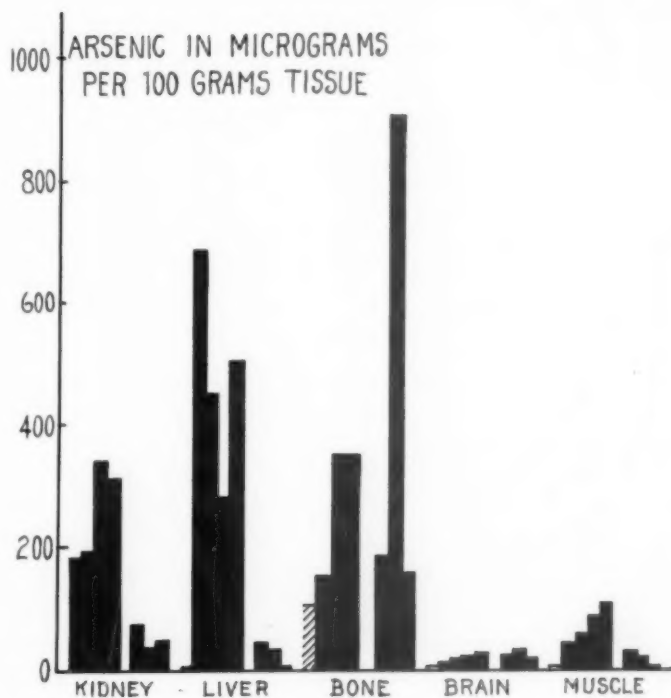
Fig. 5.

not analyzed, e.g. skin, bowel wall, plus some losses which occurred in the collection of urine and feces.

The amounts of arsenic found in the various tissues expressed as micrograms of arsenic per 100 grams of fresh tissue are indicated in figures 4 and 5. The first block represents the amount found in the control, and the next four the values found on each of the four successive days of treatment. Following this there is a break to indicate cessation of treatment, and each of the following blocks represents amounts found four, eight, and sixteen days following the cessation of treatment. The blood level is that obtained just before the tenth dose of mapharsen of that particular day, and is the same as that represented by the solid line in figure 1. It is inserted here for comparison. These values are presented in tabular form in table 1, which also contains the results obtained by analysis of bile aspirated from the gallbladder.
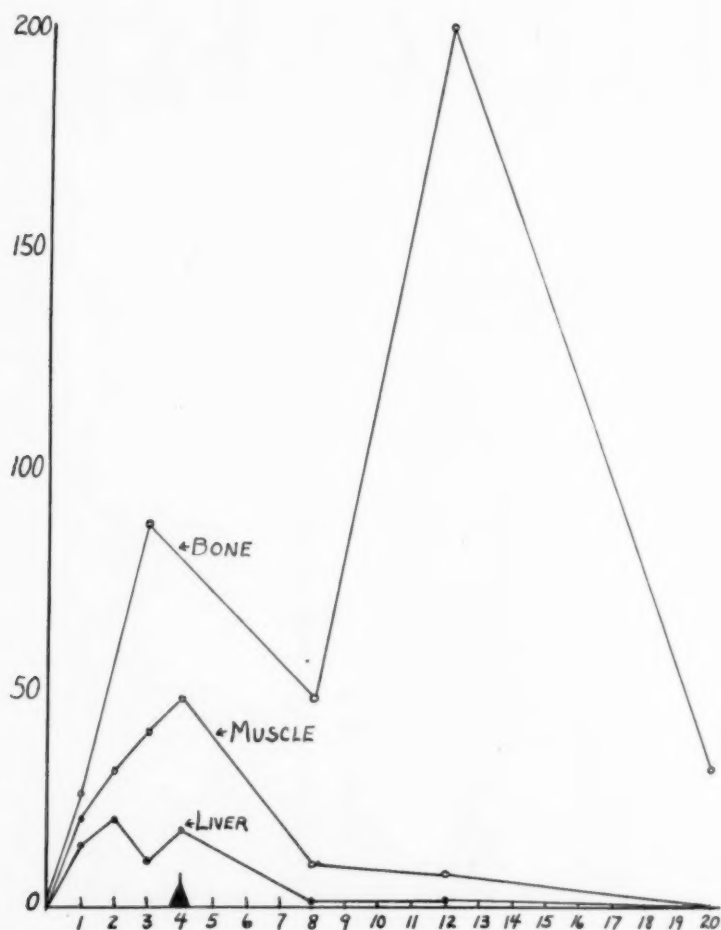
FIG. 6. Arsenic in micrograms per 100 grams multiplied by organ or tissue weight ÷ total body weight.

The results of an attempt to estimate the total amounts of arsenic in the various organs and tissues are presented in figure 6. This was done to emphasize the magnitude of the storage of arsenic in the skeletal and muscular systems, a fact which is not readily appreciated when the results are expressed in micrograms per cent of tissue.

The microscopic sections from tissues of these animals were examined by Dr. E. M. Hall of the Department of Pathology, who reported that sections of the brain, heart, spleen, and lung failed to show any significant changes. The liver cells tended to be swollen and pale probably due to high glycogen content.   The nuclei of the hepatic cells were well preserved.   In the kidneys the only findings were a diffuse granular swelling of the tubular epithelium with moderate karyolysis.   The findings in the livers and kidneys were interpreted as being minimal and entirely reversible.

TABLE I

Arsenic in Tissues, Expressed as Micrograms of Arsenic per 100 Gm. Fresh Tissue

Tissue	Days of Treatment							
	Control	1 day	2 days	3 days	4 days	4 days after R	8 days after R	16 days after R
Heart	4	49	35	58	64	20	12	0
Lung	0	48	63	76	75	22	15	10
Liver	6	684	445	263	535	46	36	8
Gall-bladder bile (total in bile)	2	—	—	5025	1600	6	11	3
Spleen	0	72	60	80	100	63	17	10
Kidney	5	182	190	340	310	75	37	41
Pancreas	0	70	65	93	70	24	12	4
Aorta	0	56	51	50	116	34	15	0
Skeletal ms.	5	38	51	85	95	26	16	0
Testicle	0	31	22	85	53	12	6	6
Peripheral nerve	4	15	35	39	101	31	30	—
Thyroid	0	51	67	84	101	41	27	21
Bone (femur)	0–100	148	—	350	—	158	761	170
Brain	3	10	16	18	18	18	28	14

DISCUSSION

The amounts of arsenic found in the blood indicate that following repeated doses of mapharsen the arsenic does not leave the blood as rapidly as it does following single doses of neoarsphenamine [3] and that by frequently repeated doses a high concentration of arsenic may be maintained.   Such a result is in keeping with the findings of Underhill and Horn,[4] who found a " lag " in the elimination of neoarsphenamine from the blood when repeated injections were given at four day intervals.   This accumulation, as observed in our experiments apparently is not due to kidney damage, as indicated by the continued excretion of large amounts of arsenic in the urine and the absence of histological evidence of important changes in these organs. It may be assumed that the tissues reach a saturation point after which they absorb less arsenic from the blood stream.

The maximum concentrations of arsenic in the blood during and immediately following these injections were not determined, as we were interested primarily in the minimum levels maintained. That the maxima became progressively higher is suggested by the values obtained one half hour after the tenth dose of each day. By the end of the fourth day this level had reached 150 micrograms per cent of arsenic in contrast to a level of 73 micrograms per cent at the end of the first day.

During the treatment period there was a slightly higher excretion of arsenic through the urine and feces in these animals given mapharsen than in the patients given neoarsphenamine by Hyman et al.[1] As with their patients, we found more arsenic excreted in the feces than in the urine. The so-called "normal" arsenic in feces and urine was so small in proportion to the amounts of arsenic with which we were dealing that for practical purposes it could be ignored. Feces and urine obtained before mapharsen was administered contained only traces of arsenic.

In view of the enormous concentrations of arsenic in the gall-bladder bile we believe that the greater part if not all of the arsenic contained in the feces reaches the bowel through the bile. Kuroda[5] on the basis of a single biliary fistula experiment states that following intravenous neoarsphenamine 9/10 of the arsenic found in the feces is excreted in the bile. Bulmer[6] had somewhat similar results with phenarsenamine. That the removal of arsenic by the liver and excretion in the bile must be quite efficient is indicated by the fact that the concentration of arsenic in the liver does not rise above the level reached during the first day of injection in spite of continued injection of large amounts during the next three days.

The concentrations of arsenic obtained in the tissues are most interesting. With but four exceptions, there is a tendency for the arsenic concentration in the tissues to parallel that of the blood. These four exceptions are brain, liver, kidney, and bone.

As has been found in other experiments with organic arsenicals, the penetration of arsenic into the brain is slight.[12, 3, 13] That there was a slight penetration is clear, but equally striking is the fact that arsenic is removed from the brain much more slowly than from any other tissue.

The concentrations of arsenic in the liver and in the kidney are not surprising in view of the known excretory functions of these organs. That the concentration in the liver reaches a maximum during the first day must indicate that the capacity of the liver to excrete the arsenic through the bile is equal to, or greater than its capacity to selectively remove the arsenic from the blood stream.

Arsenic in the gall-bladder disappeared very rapidly following the cessation of mapharsen. The arsenic content of the liver dropped much more rapidly than that of the kidney. This apparently indicates that after the initial large amounts of arsenic have been excreted, the major portion of the remaining arsenic is excreted through the kidney rather than the liver.

The deposition of arsenic in the bones is a phenomenon which has been emphasized but little, especially in the American literature.   Bulmer [6] found a considerable deposition of arsenic in the bones following the injection of phenarsenamine.   Fuchs [7] and Popp [8] reported accumulation of arsenic in the long bones following inorganic arsenic administration to human beings. Boos and Werby [9] state, " Our study seemed to show that when the individual lived only a few hours (after poisoning) the amount in bone was quite small, whereas the bones of those cases who had lived several days showed a substantial quantity of arsenic."   These authors also found the arsenic content of the bones of food animals (beef, pork) to be as high as 8.0 parts of As_2O_3 per million.

These findings are in accord with our observations that there is an accumulation of arsenic in bones which reaches its maximum after arsenic administration has been stopped and while the arsenic concentration in other tissues is falling.   This would indicate a secondary mobilization of the arsenic with secondary deposition in the bone.

Some determinations were made on the bone marrow but are too few in number to be conclusive.   There is apparently a considerable accumulation of arsenic in the marrow, but to a smaller degree than in the bone itself.

The cross hatched block in the bone analyses shown in figure 6 represents the maximum blank obtained from numerous bones of dogs and human autopsy material.   These were analyzed not only by our method but by the A. O. A. C. official Gutzeit method as well.   The determination of arsenic in bones offers considerable technical difficulties.   The high content of pyridine compounds interferes with the evolution of arsine in the various modifications of the Gutzeit and Marsh tests.[11]   With our method special care must be taken to avoid contamination by phosphorus.   This can be readily accomplished by a double distillation procedure.

One is of course tempted to estimate whether the concentrations of arsenic obtained in the tissues are spirocheticidal.   Eagle [10] has determined that mapharsen, " arsenoxide," in the presence of the edematous ooze from a rabbit chancre has a definite antispirochetal action within 1 to 2 hours at room temperature (25 to 34° C.) in concentrations of approximately 1 : 1,000,000 to 1 : 4,000,000.   Taking 1 : 1,000,000 as the spirocheticidal level would mean a level of 29 micrograms of arsenic per 100 grams of fresh tissue calculating mapharsen on the basis of 29 per cent arsenic content and further assuming that all of the arsenic in the tissues is in the form of mapharsen.   This would mean that all of the tissues examined with the exception of the central nervous system had during the four day treatment period concentrations of arsenic which were spirocheticidal.   However, we have no way of proving that the arsenic present was in the form of " arsenoxide " or some other antispirochetal form so that the above assumptions are not entirely valid.   On the other hand such assumptions may not be totally invalid, for in Eagle's experiments the concentration of " arsenoxide "

as such was known only at the beginning of the experiments and how rapidly
the " arsenoxide " may have broken down into therapeutically inert forms
is not known.

Of definite significance is the absence of serious damage to the tissues
by the large doses of mapharsen as seen in the microscopic sections.   While
these findings are very encouraging, it is emphasized once again that this is
but a single step of the many suggested at the beginning of this paper which
should be taken before more general use is made of this method in the treat-
ment of human syphilis.

SUMMARY AND CONCLUSIONS

1. By the continuous intravenous drip method dogs were given doses of
mapharsen comparable to those proposed for the treatment of syphilis in man.

2. The concentrations of arsenic obtained in the blood, urine, and various
tissues are presented and their significance is discussed.

3. Histological examination of the tissues revealed but minimal changes.

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THE IMMEDIATE PROGNOSIS OF CONGESTIVE HEART FAILURE *

By Norman H. Boyer, M.D., C. Edward Leach, M.D., and Paul D. White, M.D., F.A.C.P., *Boston, Massachusetts*

In a previous study [1] the underlying causes and precipitating factors in 1000 patients with congestive heart failure were analyzed, and in 748 patients followed for three months or longer the immediate prognosis was appraised. Patients who died or who remained in failure at rest during the minimal three months' follow-up period were considered together as a single group and designated as having a poor outcome. The results of this study indicated that the immediate prognosis was, in general, independent of the underlying type of heart disease. The precipitating cause of failure, however, played an important rôle in prognosticating the outcome, not only because some of the precipitating causes were uncontrollable, but also because the apparent benignity or malignancy of any precipitating factor is a fair measure of the myocardial reserve before the actual onset of congestion. Thus when failure is precipitated by a relatively mild respiratory infection, it seems obvious that the myocardial reserve must have been already very low. On the other hand, auricular fibrillation with a very rapid ventricular rate can precipitate failure in a diseased heart with high reserve and probably even occasionally in a heart which is otherwise apparently normal. Consequently, with adequate control of the heart rate, a good deal of myocardial reserve may be regained, although naturally tachycardia of any sort may also excite failure when the reserve is low.

Figures 1 and 2, arranged according to underlying causes and exciting factors respectively, will serve to illustrate graphically the proportion of poor results in the 748 patients adequately followed.

That the prognosis of congestive failure may be modified by the presence of complications was alluded to in the previous paper,[1] where it was pointed out that such complications will necessarily cloud the exact evaluation of the prognosis of heart failure alone. There were 242 patients with significant complicating pathological conditions, and in 71 instances the complication was totally unrelated to the heart failure or to the cardiovascular system. The complications were, of course, of varying importance and in a few instances the heart failure might better, perhaps, have been classified as a complication of some other disease of more immediate importance. Of this group with complications, 84 per cent did poorly, as compared to 63 per cent for the entire series.

The more frequently encountered complications include embolism (peripheral or pulmonary), anemia, diabetes, cerebral vascular accidents,
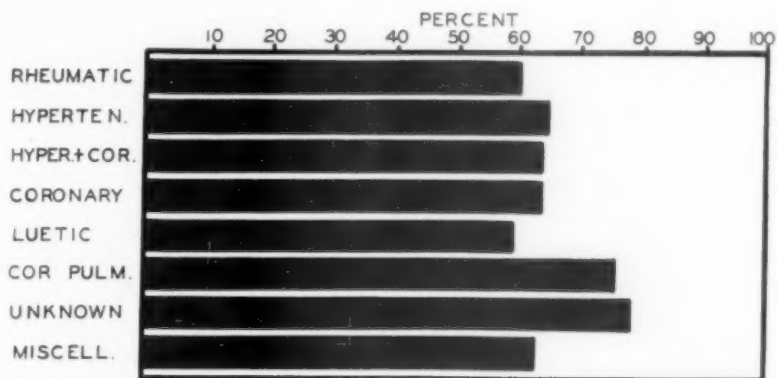
FIG. 1. Poor outcome in congestive failure according to type of heart disease, i.e., patients who died or remained in failure at rest during a minimum three months' follow-up period. Miscellaneous causes include congenital heart disease, calcareous aortic stenosis, beri-beri, and cases with hypertension which could not be classified as with or without complicating coronary disease.
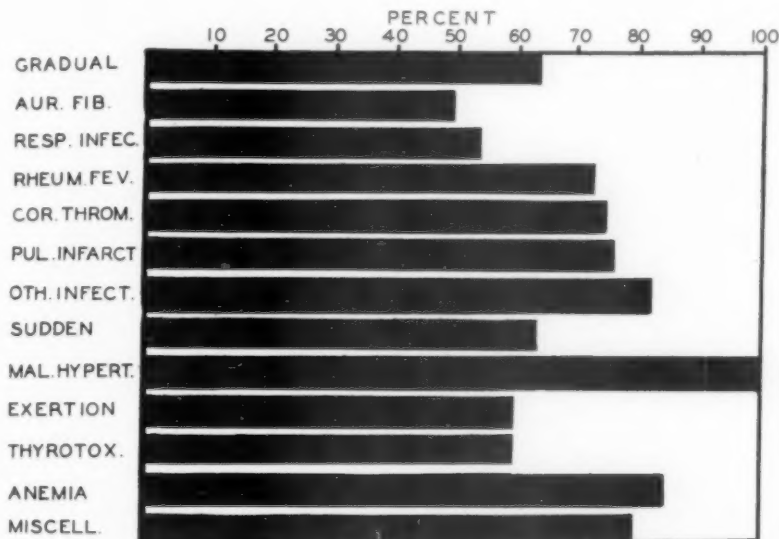
FIG. 2. Poor outcome in congestive failure according to precipitating cause of failure, i.e., patients who died or remained in failure at rest during a minimum three months' follow-up period. Miscellaneous causes include surgical operation, paroxysmal tachycardia, pulmonary malignancy, pregnancy, bronchial asthma, emotion, trauma, " indigestion " or gall-bladder colic, and administration of an excess amount of fluid.

and pneumonia. Pulmonary embolism with infarction was by far the commonest complication, having been recognized as a complication in 60 cases of the entire series of 1000 patients with congestive heart failure, in addition to 33 instances in which it was considered to be the precipitating cause of failure. All of the underlying types of heart disease appear to be liable to pulmonary infarction, although in patients with rheumatic heart disease the

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complication makes up a larger part of the total number of complications than in those with other types of underlying heart disease.

The purpose of the present communication is to emphasize additional factors of importance in determining the immediate prognosis in the same group of 748 patients with congestive heart failure. We are including also data on an additional group of 167 patients with acute coronary occlusion, in whom congestive failure was associated in 111.
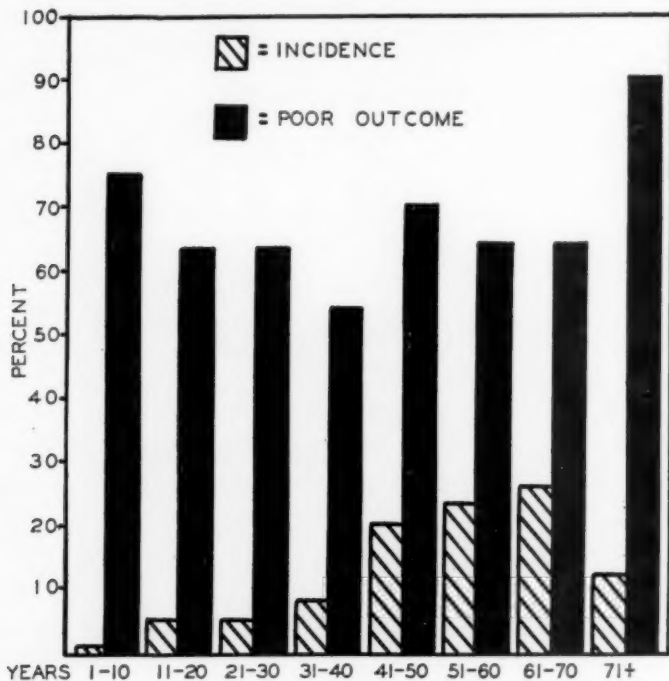
Fig. 3. Age incidence and percentage of poor outcome of congestive failure.

AGE INCIDENCE

Figure 3 has been constructed to show the distribution of cases by decades and the relation which age bears to recovery. The peak of the incidence of congestive heart failure lies between the ages of 40 and 70. The outcome was fairly constant for all age groups and corresponds closely to the outcome for all types of heart disease, with the exception of three peaks. Seventy-five per cent of a small group of children up to 10 years old did poorly. All but one of these had severe rheumatic infection with failure, and such an outcome might be expected. The peak during the fifth decade is not so easily explained. Since there is no great difference in the outcome for the various underlying factors, and since this age group fairly well represents them all, it is apparent that a preponderance of any one type of heart

disease will not explain this observation. When, however, the exciting factors were listed according to age distribution and outcome, a possible explanation of the difference between the age group from 41–50 and the adjacent groups that apparently do better appeared. Of those patients whose failure began gradually, as it did in 30 per cent of the patients in the fifth decade, 85 per cent did poorly, as compared to 64 per cent for all ages combined. The explanation which occurs to one at once is that these are the people who are in the prime of life and are busily engaged as breadwinners and homemakers and that, as such, they neglect themselves until failure is well advanced. Whether this or another more occult reason is the true one must remain unanswered at present. The difference, in any event, is slight and may be largely fortuitous. The somewhat lower percentage of poor results in the preceding decade (31–40) is doubtless in part, at least, attributable to the greater incidence of auricular fibrillation (exclusive of cases associated with acute rheumatic fever) as a precipitating cause (15 per cent in decade 31–40, 8 per cent in decade 21–30, and 7 per cent in decade 41–50), since figure 2 shows that auricular fibrillation carries the best prognosis of all exciting factors.

The third peak occurs in the group of patients over 70 years of age. This increase in the percentage of patients with poor outcome is true for all cases in this age group, regardless of the precipitating factor. For example, 82 per cent in this group do poorly when failure occurs gradually as compared with 64 per cent for all ages combined. Coronary thrombosis with myocardial failure was 100 per cent fatal in this group, while in all age groups combined 78 per cent did poorly. Auricular fibrillation, which for all ages has 49 per cent poor recovery, shows 100 per cent poor results in patients over 70. Respiratory infection, with a recovery rate of almost 50 per cent for all groups, results in failure from which compensation is not regained in 75 per cent of the elderly patients. Thus it is apparent, and not very surprising, that regardless of other circumstances, congestive heart failure in patients over 70 years of age carries a grave prognosis.

Figures 4 and 5 were constructed to show the average age incidence for the more common underlying causes and precipitating factors. There is, of course, considerable scatter, but the charts represent the general trends and serve to illustrate some points of interest. Rheumatic and coronary disease represent the two extreme age groups of the underlying causes of failure (figure 4). Further, it appears that failure occurs in uncomplicated hypertension at a significantly earlier age than it does in hypertension complicated by coronary disease. The age incidence in the latter group is close to that of coronary disease alone, and, *a priori,* heart failure would seem to be more dependent on the coronary disease than on the hypertension.

Rheumatic fever and malignant hypertension, as is well known, more commonly afflict young people (figure 5). Auricular fibrillation, too, precipitates failure in relatively youthful patients, and this may, in part, account
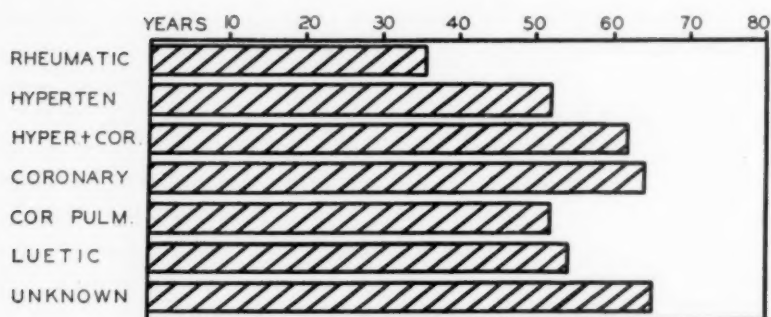
Fig. 4. Average age incidence of each of the underlying causes of congestive heart failure, at the time of onset of the failure.
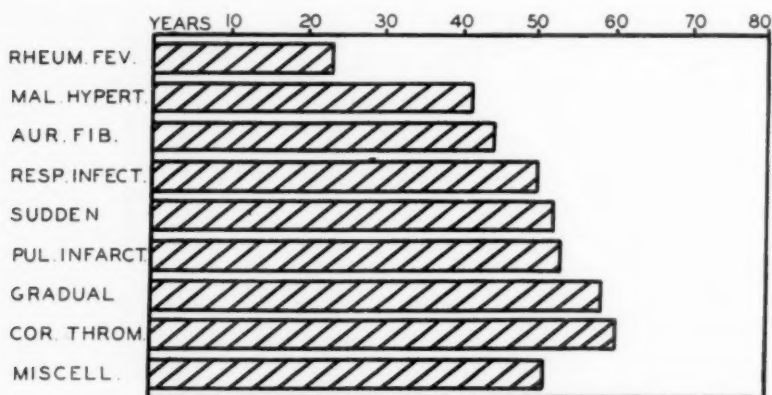
Fig. 5. Average age incidence of some of the more important precipitating factors, at the time of onset of the failure.

for the relatively good prognosis of auricular fibrillation. The average age incidence for failure precipitated by coronary thrombosis was the highest of all known exciting causes.

CORONARY THROMBOSIS AND HEART FAILURE

In the previous study of congestive failure [1] it was observed that when coronary thrombosis precipitated congestive failure there appeared to be no difference in the outcome, whether the patient was also hypertensive or not. There were 63 patients with coronary disease and congestive failure who had hypertension and 63 who had normal, or low, blood pressure, and in each group the outcome was poor in about 75 per cent of the cases. It seemed unlikely, at first, that patients with the additional handicap of hypertension would fare as well as those without. The obvious source of error, it was thought, might lie in the group of patients with unknown preëxisting hypertension, but with normal or low blood pressure on admission to the

hospital. Accordingly, this factor was investigated in 167 patients * with coronary occlusion, in whom the previous blood pressure was known. Seventy-seven patients were known to have had hypertension, and 90 known to have had normal blood pressure previous to the coronary occlusion. It is apparent from figure 6 that when patients with hypertension reach the
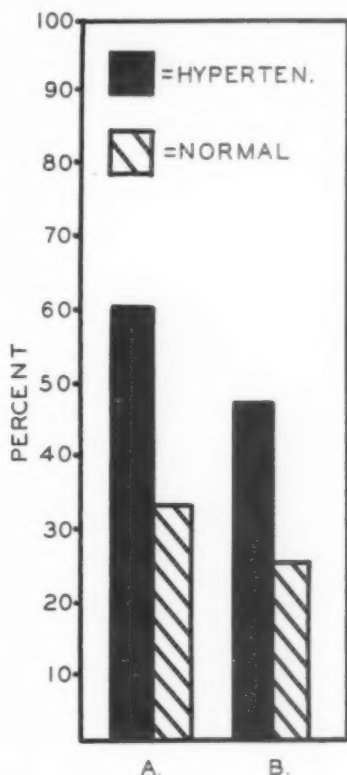
FIG. 6. Coronary occlusion and congestive heart failure. Percentage of patients with signs or symptoms of congestive failure before the onset of clinical coronary occlusion is labelled A; percentage of patients in whom congestive failure was precipitated by coronary occlusion is labelled B. It is evident that patients with hypertension not only are closer to congestive failure before coronary occlusion but also are more frequently precipitated into failure by occlusion than are patients with coronary disease alone.

age at which coronary occlusion is likely to occur, they already are on the edge of failure, for 60 per cent of the patients in this group had signs or symptoms of decreased myocardial reserve before the coronary occlusion, as compared to 33 per cent of non-hypertensive patients with coronary disease who exhibited similar loss of myocardial reserve antedating the occlusion. Furthermore, of the patients who had no evident antecedent failure, a considerably greater number of the hypertensives than of the non-hypertensives

* We are indebted to Dr. E. F. Bland for making the data on 125 of these patients available to us.

were precipitated into failure by the occlusion.   Since there is general agreement that when congestive failure accompanies coronary thrombosis the outlook is grave, it seems to follow that patients with hypertension and coronary occlusion will do less well than those with normal blood pressure.   Certainly there seems to be little support in this series of cases for Levine's [7] opinion that hypertensive patients with coronary occlusion tend to fare better than do those with a normal blood pressure.   To be sure, there are factors other than congestive failure which determine the prognosis of coronary thrombosis, but congestive failure would seem to be one of the most important prognostic leads in comparing hypertensive with non-hypertensive subjects.

In the latter series of patients with coronary occlusion and congestive failure, as well as in the original study, the proportion of cases that did poorly was equal in the hypertensive and non-hypertensive groups.   Seventy-five per cent of patients who exhibit congestive failure accompanying coronary occlusion may be expected to die or to remain seriously crippled by congestive failure, whether antecedent hypertension was present or not.   It seems, therefore, that once failure has developed in patients with coronary disease alone or in those with hypertension in addition to coronary disease, the myocardium has an equal capacity for regaining its reserve in both instances.   Recovery may be hampered in the one, because of long-continued strain with cardiac hypertrophy and relative coronary insufficiency; in the other, because of generalized narrowing of all the coronary vessels with perhaps several actually occluded.   Figure 1 indicates that this is true for all cases of coronary disease, irrespective of the precipitating cause of failure. It is of further interest that the proportion of patients with hypertension alone who do poorly is equal to that of patients with coronary disease alone, or of those with combined hypertension and coronary disease, despite the fact that the average age at the onset of failure in patients with hypertension alone is ten years earlier than in those with coronary disease in addition to hypertension (figure 4).

Since the conclusion that the prognosis of patients with hypertension and coronary occlusion is poorer than of non-hypertensive cases with occlusion differs from opinions previously expressed, and since it was suspected that a fall in blood pressure from hypertensive to normal levels may have been a source of error in previous studies, our patients were divided into those with and those without a significant fall in blood pressure.   Of the 77 known hypertensives, there was a significant fall of blood pressure with coronary occlusion in 83 per cent, *and in 75 per cent of these it fell to normal or below.* In the group of patients known to be non-hypertensive, a substantial fall in pressure occurred in 50 per cent.

Figure 7 has been constructed to illustrate the frequency with which congestive failure eventuates when coronary occlusion is accompanied by a notable fall in blood pressure.   It appears that when a material fall in pressure occurs, either because it reflects the severity of the attack or be-

cause in itself it may be partly due to failure of the myocardium, congestive failure more often ensues than when coronary occlusion is not attended by such a fall in blood pressure.   The corollary necessarily follows that when a hypertensive patient remains hypertensive despite acute coronary occlusion, he will be less likely to develop congestive failure and, other things being
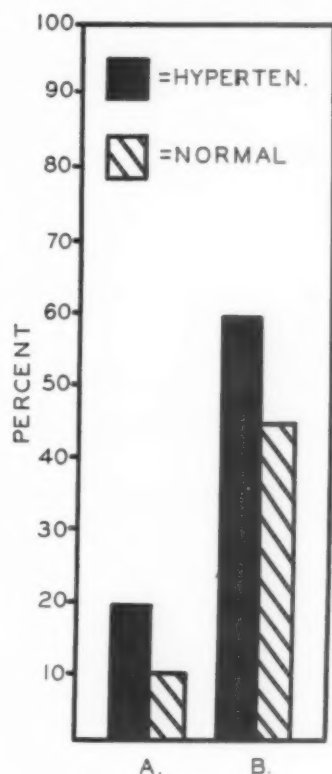
FIG. 7.   Incidence of congestive failure precipitated by clinical coronary occlusion when the latter is not accompanied by a significant fall in blood pressure A, and when it is accompanied by a fall in blood pressure B.   It appears that if the blood pressure remains elevated following coronary occlusion, congestive failure is less likely to follow.

equal, his prognosis will be better.   It seems justifiable to conclude that failure to recognize the fact that coronary occlusion in patients with hypertension is less well borne than in non-hypertensives arises from the circumstance that the hypertensive subject is more likely to have a fall in pressure which, in the majority of cases, will be found to be normal following occlusion.   The error of classifying such patients as non-hypertensives not only improves the statistics of the hypertensive group but in addition unfavorably weights the non-hypertensive group.

CARDIAC ENLARGEMENT AND PROGNOSIS

Attention to cardiac enlargement in heart failure has been centered largely on heart weight at postmortem examination, and, in general, a direct correlation between increasing weight and heart failure has been found. Thus Nathanson [2] found signs of failure in only 6.6 per cent of hearts weighing less than 400 grams, while failure was present in 63.2 per cent of those over 400 grams.   Clawson and Bell [3] found only three cases with a heart weight of less than 500 grams among 28 patients with congestive failure due to luetic aortic regurgitation, and these three had hearts weighing between 450 and 500 grams.   The same authors [4] found in 94 cases of failure due to hypertension that only 10 had heart weights below 450 grams and 23 had heart weights below 500 grams.   Gross and Spark [5] studied the relationship
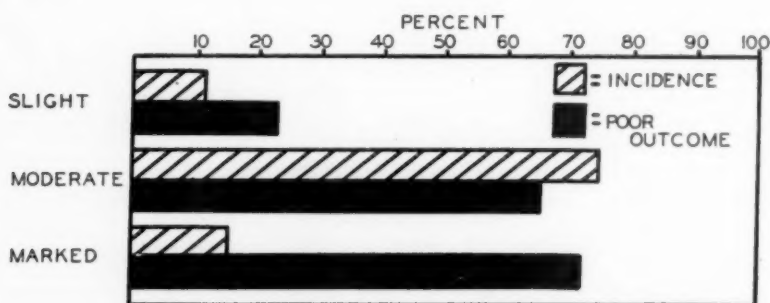
FIG. 8.   Incidence of clinical cardiac enlargement and the relationship which it bears to outcome.

of hypertrophy to failure and concluded that the common denominator of all cases of heart failure, except that associated with acute inflammatory change, was a disproportion between the coronary blood flow and the bulk of cardiac muscle, and that increasing cardiac hypertrophy eventually outstrips its blood supply, thus resulting in myocardial failure.   This concept has recently been challenged by Davis and Blumgart [6] who believe that cardiac hypertrophy results from chronic congestive failure and that this accounts for the heavy hearts found post mortem in patients with failure.   Gross and Spark were unable to correlate heart weight with the duration or severity of heart failure.

At the time the present case histories were studied, heart size was not particularly investigated, but in 277 cases the tabulated data contained information from which the heart size, as determined by physical examination and/or teleoroentgenogram, could subsequently be classified.   The degree of enlargement was graded as slight when the apex of the heart was up to 1 cm. outside the midclavicular line, moderate when up to 3 cm., and marked when over 3 cm. outside the midclavicular line.   This study appeared to be of especial interest because, first, the measurements were made during life and hence could be used prognostically, and, second, clinical enlargement is pre-

dominantly a measure of dilatation rather than of hypertrophy, a factor not hitherto adequately evaluated. Of the 277 cases, 187 were followed sufficiently long to provide an estimate of the immediate prognosis. The data are illustrated in figure 8 where it is clear that most patients fell into the group with moderate cardiac enlargement. There were a few patients with very large hearts and a few with only slight enlargement. It is also apparent in the figure that the latter group, on the whole, did very well, whereas the outcome became progressively poorer as the degree of enlargement increased. It is worthy of note, however, that even in the group with marked enlargement, 29 per cent made a fair or good immediate recovery.

SUMMARY AND CONCLUSIONS

The immediate prognosis in 748 patients with congestive heart failure has been studied and found, in general, to depend very little on the underlying type of heart disease, but, in varying degree, on the precipitating cause of failure, the patient's age, the degree of clinical cardiac enlargement, and the presence or absence of complications.

An additional analysis of the case histories of 77 known hypertensives and 90 known non-hypertensives with coronary thrombosis revealed that a greater percentage of hypertensive patients will develop congestive heart failure than will the non-hypertensives, and consequently the prognosis is poorer for the former group of patients when coronary occlusion occurs. Once failure develops, however, the outcome is the same for those with or without antecedent hypertension.

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THE FREQUENCY AND CHARACTER OF URINARY TRACT INFECTIONS IN AN UNSELECTED GROUP OF WOMEN *

By CHARLES D. MARPLE, M.D., *San Rafael, California*

THIS study was prompted by the observation that positive urine cultures were obtained as a purely incidental finding from many of the women hospitalized on the Stanford Medical Service. It was the impression of the staff that many of these patients presented no symptoms referable to their urinary tracts. The questions which immediately arose were: What is the significance of these positive urine cultures and what is the frequency of urinary tract infections in this type of woman?

Interest in the incidence of and in the significance of urinary tract infections is far from being purely academic. Several investigators have pointed out a series of events, starting with the protean urinary tract infection and leading through pyelonephritis to renal damage and hypertension.[1]

A fairly comprehensive, although by no means exhaustive, review of the literature on urinary tract infections failed to reveal any adequate studies on the incidence of these infections in the general population of a women's medical ward. Leischman[2] reported that 8 per cent of catheterized urines obtained under aseptic conditions from 50 healthy women yielded a growth of *B. coli,* but that none exhibited pyuria. Leischman also showed that, without aseptic technic, nine out of ten such urines would yield growth of *B. coli.* His paper emphasizes the danger of contaminating urine specimens with the normal bacterial flora of the urethra, a source of error which has frequently been noted in the literature.[3]

MATERIAL

Routine cultures of the urine and, in the majority of cases, Addis counts on the urinary sediment were done on 100 women hospitalized in the women's medical ward, clinic service, between October 1939 and April 1940. The cases were consecutive and unselected with the following exceptions. An occasional critically ill or moribund patient was not disturbed. Early in the study a few patients were missed because the routine for obtaining specimens had not been established.

Actually the group is not completely unselected. Clinic patients fall, as a whole, into the lower social and economic brackets. The majority of the patients were sufficiently ill to require hospitalization, but an appreciable number received diagnoses of functional disorders and an occasional individual was brought into the ward more for purposes of demonstration than because of need of hospital care.

The youngest patient was 16 years and the oldest 80 years; distribution was very nearly equal on either side of 45 years (table 1). Ninety-two per cent were married and the majority had passed through one or more pregnancies.

TABLE I

Age Distribution
Age Range: 16–80 years

Age Group	No. of Patients	Total
15–25	8	
25–35	15	
35–45	32	55
45–55	20	
55–65	18	
65–75	6	
75+	1	45

METHOD

I. *Obtaining Specimens for Culture.* All urine specimens for culture were obtained by catheterization and this was done by the author. The vestibule was first cleansed with solutions of green soap and of boric acid, and the urethral meatus and surrounding surfaces were painted with mercurochrome upon an applicator. A second applicator dipped in mercurochrome was then gently inserted into the urethra and held there for several seconds. To minimize contamination from failure to insert the catheter directly, glass catheters were used exclusively. If direct entry was not made on the first attempt a clean catheter was used. One or more ounces of urine were allowed to flow from the bladder before a 10 c.c. sample was collected in a sterile test tube, the mouth of which was flamed before and after collection of the specimen. Samples so obtained were taken to the bacteriological laboratory and inoculated into the culture media without delay. No specimen stood for more than one half hour before cultivation. The only specimens obtained without supervision and used in this report were urethral and bladder samples collected by the gynecologists during cystoscopy.

II. *Obtaining Specimens for Addis Counts.* Timed specimens of concentrated urine were usually obtained during the catheterization for the urine culture according to the method of Addis.[4, 5]

III. *Method of Cultivation.* All cultural work was done by the author. The media used and the methods of inoculation may be summarized as follows:

(*a*) 1 c.c. of urine was pipetted into 10 c.c. of peptic digest broth to which had been added 0.8 c.c. of sterile goat's blood.

(*b*) 0.5 c.c. of urine was pipetted onto the surface of an E. M. B. plate and spread with a glass dolly.

(*c*) 0.5 c.c. of urine was pipetted onto the surface of a blood agar plate (containing 10 to 15 per cent blood) and dollied.

(d) Blood pour plates (each containing approximately 5 per cent goat's blood) were made in dilutions ranging from 1 : 10 to 1 : 1000, or higher if the occasion demanded. Originally dilutions were made by adding measured portions of the urine to tubes of melted agar which had been cooled to 42° C. Because of the inaccuracy of this method, later urine samples were diluted in 10 c.c. portions of sterile physiological saline and 1 c.c. samples of these dilutions transferred to the Petri dish.

The cultures were incubated at 37° C. and examined after 24 and after 48 hours for growth.

The reasons for this choice of media are as follows: (a) Enriched media are necessary for the growth of certain strains of streptococci and of other organisms. The experience of our laboratory has been that a concentration of 10 to 15 per cent blood is adequate for the growth of the fastidious organisms commonly encountered. (b) Partially or completely anaerobic organisms in the urinary tract have been described since 1896,[6] and a recent report from the Mayo Clinic[7] emphasizes the value of searching for such organisms. It was not feasible for us to make completely anaerobic cultures of our specimens, but we did think that the use of broth and pour plates would allow the growth of partial anaerobes which might fail to grow on surface media. In several cases this opinion has been substantiated. (c) It is imperative to make quantitative counts of colonies. This is evident in reviewing laboratory reports which indicate a wide variation in the density of growth of positive urine cultures. Reports of " a few staphylococci " or " slight growth " may well represent contamination. It is apparent that the procedure of inoculating only liquid media is inadequate since the amount of growth after 24 hours is no indication of the number of organisms seeded.

The colonies in the pour plates were counted after 48 hours. In heavy infections the greatest dilution frequently revealed a growth too dense to count, but in every case this represented a dilution of at least 1 : 1000. Therefore, when a count could not be made on the greatest dilution it was recorded as follows:

	Colonies too numerous to count in dilution of:	Indicate at least this number of colonies per c.c.
1+	1:1000	100,000
2+	1:10,000	1,000,000
3+	1:100,000	10,000,000
4+	1:1,000,000	100,000,000

IV. *Identification of Organisms.* Smears of colonies from at least one surface plate and from the broth were made routinely. Individual colonies were picked and subcultured for further identification. The basis for classification of each organism was as follows:

(a) Staphylococci. Identified by growth on Loeffler's slant. Coagulase test performed on isolated staphylococci.[8, 9]

(b) Streptococci. Identified according to their ability to produce hemolysis in blood pour plates. (Brown's classification.[10]) Hemolytic streptococci further classified serologically. (Lancefield's classification.[11, 12])

(c) Colon-typhoid group. Isolated on Russell's slants. Identified biochemically in broths containing the various sugars. Vosges-Proskauer and Methyl Red tests were resorted to as necessary.

V. *The Addis Count and Interpretation Thereof.* The technic of this test, a measure of the rate of excretion of the various formed elements in the urine, is amply described in Addis's publications [4, 5] and in the standard texts on laboratory procedure. The normal established by Addis [13] for the number of pus and renal epithelial cells excreted per 24 hours is two million. This normal was established on a group of healthy young male medical students and we feel that an increase of several million cells per 24 hours cannot be considered abnormal for our type of patient. Addis counts were not done on all patients and were purposely omitted in cases with gross pyuria. Credit must be given to members of the resident staff who performed many of the counts.

VI. *Repeated Cultures.* Reports to the ward of all positive and all doubtful cases included a request for repeated cultures. These were obtained in many cases but, particularly in the early stages of the study, some patients were discharged or transferred before additional cultures could be obtained.

VII. *Information Concerning the Patient.* Complete histories were taken and thorough general examinations were made. Pelvic examinations were done by the resident staff and, in some cases, were confirmed by gynecological consultation.

VIII. *Other Laboratory Procedures.* Pyelograms, renal excretion tests, cystoscopies, etc., were performed by the resident staff. No attempt was made to urge such procedures since one of our purposes was to determine how adequately suspected urinary tract infections are studied routinely.

RESULTS

The 100 cases in the series are analyzed according to the following classification:

I. Negatives: Cases whose initial urine culture was sterile (including six cases which developed urinary tract infections in the hospital).

II. Positives (bacilluria plus pyuria): Cases from which a heavy growth of bacteria was obtained on initial urine culture in association with a definite increase in the number of pus cells excreted in the 24 hour period.

III. Transient bacilluria.

IV. Bacilluria without pyuria: Cases presenting a heavy growth of bacteria, but no increase in the excretion of pus cells.

V. Small numbers of bacteria; pyuria mild or absent.

VI. Hospital infections.

I. *Negatives.* Cultures of the first catheterized urine specimen from 69 of the 100 patients (69 per cent) were sterile. Six of these patients subsequently developed urinary tract infections while in the hospital. These six, included here for statistical purposes, are discussed in a separate section. A single obvious hospital infection from which no culture was obtained until the acute infection had arisen is omitted from the present section.

Of the 63 cases which did not develop an infection at any time, only a single culture was obtained from 55, two negative cultures were obtained from six and three negative cultures were obtained from two. Of the six cases which developed hospital infections, five had single negative cultures and one had two negative cultures before a positive culture was obtained.

Not a single member of this group gave as a presenting complaint any symptom or group of symptoms referable to the urinary tract. In only two of the cases which did not develop a hospital infection was a diagnosis made of pathological change in the urinary tract, and in both of these the diagnosis was "mild unilateral hydronephrosis" based on pyelograms. A past history was obtained from 68 of the 69 patients in the group. Reference to the urinary tract was completely negative in 29 (42.7 per cent) and was positive in 39 (57.3 per cent). Each of the patients admitting past urinary difficulties enumerated single or multiple symptoms over vague and protracted periods of time; 34 (50 per cent) noted nocturia, alone or in combination, and 13 (19.1 per cent) mentioned frequency or dysuria. Twenty patients (29.4 per cent) described definite episodes of urinary tract disorder; 13 (19.1 per cent), a single attack, and 7 (10.3 per cent), two attacks. These attacks are briefly described in table 2 and are summarized statistically in table 4.

No patient in this group admitted any definite urinary tract disorder relating to the present illness, although 11 (16.2 per cent) connected the onset of single symptoms, such as nocturia or dysuria, with the present illness.

Pelvic examination was performed in 63 of the 69 cases; it was unremarkable in 36 (57.1 per cent), but revealed abnormalities in 26 (42.9 per cent). These abnormalities are summarized in table 5.

Pyuria was present in 11 cases, in 10 of which it seemed to be adequately explained by diagnoses other than urinary tract infection. Pyelograms were made in 12 cases; were normal in four (33.3 per cent) and showed some abnormality in eight (66.7 per cent). Probable explanations for the pyuria in these cases and condensed reports of abnormal pyelograms are summarized in table 2.

TABLE II

TABLE II

Cases Presenting Negative Cultures but Some Positive Findings Referable to the Urinary Tract

Case No.	Past History of Definite Urinary Tract Episode	Presence of Pyuria and Possible Explanation Thereof	Abnormalities Found by Pyelographic Examination
4	1938, urinary retention and lumbar pain. 1939, dysuria, frequency and hematuria, 2 weeks		
5			
7	1934, toxemia of pregnancy		Left upper calyx slightly dilated and has poor drainage
9	1923, ulcerated ureter, burning and frequency, 3 months. 1928, uremia with first pregnancy		Left terminal calices irregular, ulcerated? Small functionless left kidney. Right renal pelvis dilated and ulcerated
10	1937, urinary tract infection		
13	1922 and 1936, urinary tract infection		
14	1939, urinary tract infection		Blunted right renal calyces
15			Bilat. anomalous renal pelves
19	1939, urinary tract infection		
21	1920 and 1923, urinary tract infections		
31		Mycosis fungoides involving bladder. Roentgen-ray therapy	No excretion from right kidney
33		Congenital lues: fever therapy	
36		Latent glomerulonephritis	
39	1925, toxemia pregnancy. 1936, urinary tract infection.	Nephrosclerosis and hypertensive cardiovascular disease	
41	1935, pain rt. flank to groin, chills, fever. 1939, rt. ureter stricture, hydronephrosis		Dilated right renal pelvis
43	1938, urinary tract infection		
49	1939, urinary tract infection		
53	1939, acute pyelonephritis	Chronic glomerulonephritis	
56		Chronic glomerulonephritis	
62	1927, urinary tract infection		
63	1939, cystitis	Generalized arteriosclerosis	
65	1934 and 1939, cystitis	Disseminated lupus erythematosus	
73			
74	1939, cystitis	Renal insuff. after sulfathiazole	
80		Hematuria after sulfathiazole	
81	1939, urinary tract infection		
84	1930, cystitis		
93			
97	1936, cystitis	Unexplained: 13/mill./24 hrs.	
100			Dilated right renal pelvis and ureter, drains well

Comment: The incidence of definite attacks of urinary tract infection in the past history of 69 patients with sterile urines at the time of their present hospital entry (29.4 per cent) confirms the impression that these disorders occur frequently. That one infection is apt to be followed by others is suggested by the high rate of recurrence (35 per cent). We are not impressed by the frequent admission of single symptoms, such as nocturia, frequency or burning, since these may arise from several causes and are highly subjective in character. The common occurrence of pelvic abnormalities (40.3 per cent) is to be expected in a group of women of child-bearing age or older. The relatively high percentage of pyelograms revealing abnormalities (66.7 per cent) is not significant since these are ordinarily not made without a suspicion of anatomical or pathological defect.

II. *Positives* (*Bacilluria Plus Pyuria*). Cultures of the first catheterized urine specimen from 19 patients (19 per cent) revealed the growth of a large number of bacterial colonies and Addis counts on the urinary sediments from these patients demonstrated definite pyuria. Histories were obtained from 18 of these cases; seven (38.9 per cent) were completely negative and 11 (61.2 per cent) positive. All of the positives admitted nocturia and nine (50 per cent) vouchsafed some other symptom. Nine patients (50 per cent) described definite attacks of urinary infection in the past. Four patients had had more than one such attack. (Tables 3 and 4.) Four patients (22.2 per cent) admitted recent urinary symptoms, but only two (11.1 per cent) described acute attacks. Only two patients presented themselves because of urinary tract symptoms. (Tables 3 and 4.) Pelvic examination was done on 17 patients; was negative in eight (47.1 per cent) and positive in nine (52.9 per cent). (Tables 3, 4, and 5). Pyelograms were made on five patients; they were negative in two (40 per cent) and positive in three (60 per cent). (Tables 3 and 4.) All 19 cases exhibited significant pyuria, and Addis counts were omitted in those with gross pyuria. Pertinent data for these cases, including bacterial counts, are summarized in table 3.

Comment: It is surprising how few of these patients exhibiting bacilluria and pyuria presented themselves with complaints referable to the urinary tract. We have already criticized the significance of a past history of single or multiple vague urinary symptoms and the irrelevance of such symptoms as regards urinary tract infections is attested by the constancy of their occurrence (table 4). A history of definite episodes of urinary tract disorder was obtained in exactly half of the positive cases and in only 29.4 per cent of the negatives. The rate of recurrence was also about 10 per cent greater in the positives than in the negatives. Few patients admitted urinary symptoms with their present illness and there is no significant variation between the positives and negatives. We had expected the relatively high per cent of pelvic abnormalities in the total series (45.5 per cent), but were surprised at the similarity of the two groups. From our material pelvic changes are not a predisposing factor in urinary tract infections.

Table 8 reveals that 12 of the 19 cases exhibiting bacilluria plus pyuria (63.2 per cent) were treated. Treatment was omitted in three cases because the patient was in the terminal stages of some other disease. Serial cultures were obtained until the urine became sterile in only four cases (21.1 per cent), but four cases were transferred or died before the infection could be cleared. Supplementary urine studies, including pyelograms, were done in only five cases (26.3 per cent).

III. *Transient Bacilluria.* A single case may belong in this category. The pertinent data are summarized in table 3.

Comment: It is unfortunate that any pyuria which may have been due to the bacilluria is masked by the primary disease. This case may have been a low-grade infection which cleared spontaneously.

VI. *Bacilluria without Pyuria.* Three cases exhibited an appreciable growth of organisms on one or more occasions without accompanying pyuria.

Comment: The first and second cases had definite bacilluria confirmed by the growth of the same organisms on a second culture. A careful check of the histories of these two cases revealed no pyuria at any time. We cannot interpret them in any way other than as low-grade urinary tract infections. The third case may have been an example of " transient bacilluria " although a second culture would have been necessary to determine this point.

V. *Small Numbers of Bacteria: Pyuria Mild or Absent.* There were seven cases from whom one or more positive cultures were obtained, but in each of these cultures the number of organisms per c.c. was so few and the pyuria, if present, so slight as to preclude any conclusions. The summaries of cases appear in table 3.

Comment: In several cases there were no repeat cultures and in at least one case a second culture was sterile. These cases cannot be dismissed from consideration since several of them have findings suggestive of urinary tract disease. There had been heavy growths of several organisms during the previous entry of Mrs. C. H. The few staphylococci found in the urine of Mrs. V. C. were found on several occasions and on the last culture the organisms were recovered from both ureters. Several of these cases had severe systemic diseases which may have been predisposing to urinary tract infection.

VI. *Hospital Infections.* There were seven clear-cut cases of urinary tract infection originating while the patient was on the ward. From six of these cases a negative urine culture was obtained prior to the occurrence of the infection; from the seventh no preceding negative culture was obtained. The summaries of cases appear in table 3.

Comment: The possible primary and predisposing causes for the seven hospital infections are summarized in table 6. Six infections followed urinary tract instrumentation or catheterization and the interval between the instrumentation and the appearance of symptoms or the obtaining of a

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Summary of Pertinent Information Concerning

Cases Exhibiting

No.	Age	Primary Diagnosis	Past History Referable to Urinary Tract	Recent Urinary Tract Symptoms	Pelvis
1	45	Arthritis and septicemia, *Staph. albus*, (coag. +).	Nocturia and dysuria for years.	None	Normal
2	22	Pyelitis of pregnancy.	None		Pregnant
3	35	Partial bowel obstruction.	Nocturia and difficulty in starting stream for years. Renal abscess drained in 1938.	None	Normal
4	46	Diabetes mellitus, acidosis.	Diurnal frequency for years. Urinary tract infection in 1938.	None	Normal
5	55	Cholelithiasis, urinary tract infection, urethral caruncle.	Frequency and dysuria, 2–3 years. Renal stone removed in 1937.	Diurnal frequency, dysuria, occasional hematuria and pyuria 2–3 years.	Cystocele, rectocele, urethral caruncle.
6	36	Bronchiectasis.	None	None	Normal
7	48	Urinary tract infection.	None	Dysuria, incontinence and difficulty in starting stream.	Normal
8	54	Arteriosclerosis, hypertension.	Right ureteral stone, 1917. Right nephrectomy, 1925. Right ureteral stone demonstrated by roentgen-ray, 1933 and 1937. Right flank and back pain, 1937. Nocturia for years.	None	General relaxation of pelvis, abraded urethral meatus.
9	36	Rheumatoid arthritis.	None	None	Normal
10	27	Acute respiratory infection.	Acute urinary retention, 1927.	None	Normal
11	39	Severe seborrheic dermatitis.	None	None	Normal
12	43	Hyperthyroidism. Entered for thyroidectomy.	Nocturia and occasional dysuria.	None	Cystocele, cervical erosion.
13	80	Myxedema. Multiple nutritional deficiencies.	Nocturia for years. Urinary tract infection, 1937.	None	Senile atrophy pelvis.
14	35	Hypertension. Entered for splanchnectomy.	Cystitis with pregnancy, 1924.	Recent nocturia.	Cystocele
15	43	Laennec's cirrhosis, advanced portal obstruction.	Severe frequency.	None	Cystocele
16	73	Coronary occlusion. Chronic cystitis.	Cystitis present since 1935. Nocturia, dysuria.	None	Normal

III

Cases Presenting One or More Positive Cultures
Bacilluria and Pyuria

Results of Urine Cultures and Addis Counts			Remarks
Hosp. day	Organisms isolated (colonies per c.c.)	Pus cells Mill/24 hrs.	
2	*B. coli*, 20,000,000 and *Staph. albus* (coag. −), 100,000	75	Constant gross pyuria. No pyelograms. Treated. No further cultures.
1 3 4 7 10	*Strept. viridans*, 70 and *Staph. albus* (coag. −), 10 *B. coli*, 3000 *B. coli*, 20,000,000 Sterile Sterile	gross	No pyelograms. Onset marked by chills, fever and G.I. upset. Treated.
7 36 42 44 48	*B. coli*, 10,000,000 *B. coli*, 20,000,000 *B. coli*, 10,000,000 Sterile Sterile	34	Laparotomy revealed only "stasis in ileum." *B. coli* were cultured from both ureters. IV pyelograms revealed small left kidney with normal function. Recurrence 1 mo. later.
3 4 9 17 27 31 39 42	Hem. strept. (Group D), 10,000,000 Hem. strept. (Group D), 10,000,000 *B. coli*, 1,000,000: Strept. 10,000,000 *B. coli*, 100,000,000: Strept. in broth *B. coli*, 100,000,000: Strept. in broth *B. coli*, 100,000,000: Strept. in broth *B. coli*, 100,000,000: Strept. in broth Hem. strept. (Group D), 1,000,000	gross	Developed acute retention and hypotonic bladder. Stormy course despite treatment. Pyelograms: functionless left kidney, large poorly functioning right kidney.
2 8	*Strept. viridans*, 100,000 and *B. coli*, 1000 *Strept. viridans* and *B. coli*, total 200	gross	Treated. No pyelograms or further cultures.
2 9	*Staph. albus* (coag. −), 10,000,000 *Staph. albus* (coag. −), 10,000,000	gross	No pyelograms. Treated.
2 7	*Staph. albus* (coag. −), 1,000,000 and *Strept. viridans*, 100,000 *Staph. albus* and *Strept. viridans*, total 75,000	gross	Had 600–700 c.c. residual. Treated. No pyelograms.
1 2	*B. coli*, 100,000,000 *B. coli*, 100,000,000	64	No treatment. No pyelograms. Presumably still has ureteral stone.
4 8 14	Unidentified Strept., 100,000,000 Unidentified Strept., 100,000,000 *B. coli*, 100,000,000 and Strept. in broth only	60	No pyelograms or further study. Treated.
3 6	*B. coli*, 1,000,000 Sterile	168	No pyelograms. Treated.
2	*B. coli*, 30,000	85	No pyelograms or treatment.
2	*Staph. albus* (coag. −), 100,000,000	9	No pyelograms or treatment.
2	*B. coli*, 1,000,000	gross	No treatment or pyelograms.
2 6 10 17 20 23 26 36	*Staph. albus* (coag. −), 16,000 *Staph. albus* (coag. −), 1,000,000 *Staph. albus* (coag. −), 65,000 Sterile Sterile Sterile *Staph. albus* (coag. −), 1,000,000	258 24 39 14 2	Cystoscopy and retrograde pyelograms revealed a dilated right upper renal calyx with stasis. Splanchnic section done on 29th day. Treated.
3 8 15 22 30	*B. coli*, 1,000,000 *B. coli*, 3,000,000 *B. coli*, 10,000,000 *B. coli*, 500,000,000 *B. coli*, 25,000,000	gross	No treatment and no further studies.
2	Gram negative bacillus giving sugar reactions of paratyphoid group but serologically unidentifiable, 189 mill.	45	Persistent UTI since 1935 had been resistant to all sorts of therapy. Died on 5th hosp. day.

TABLE III

No.	Age	Primary Diagnosis	Past History Referable to Urinary Tract	Recent Urinary Tract Symptoms	Pelvis
17	34	Acute hepatitis and Laennec's cirrhosis.	None	None	Normal
18	55	Thyrotoxicosis	None	Nocturia and frequency.	Senile changes.
19	65	Urinary tract infection, acute.	Hematuria, dysuria, frequency as a child. Acute urinary tract infections, 1922, 1934, 1935, 1936, 1937, 1938.	Frequency and burning, 5 days.	Normal

Case of

| 1 | 40 | Disseminated lupus erythematosus. | Back and flank pain with pyuria 15 years ago. | None | Normal |

Cases Exhibiting

1	43	Hypertension	Nocturia for years.	None	Cervical erosion.
2	45	Hypertension. Urinary tract infection.	Low back pain and "gravel in urine" 15 years ago.	Lower abdominal pain, burning, urgency and frequency, 3 months.	Bartholin cyst.
3	59	Carcinoma, stomach.	None	None	Normal

Cases Exhibiting Growth of Few

1	64	Coronary occlusion.	Nocturia for yrs.	None	Normal
2	41	Rheumatoid arthritis.	None	None	Eroded cervix.
3	60	Arteriosclerosis. Hypertension.	Nocturia for yrs.	None	Urethra polyp.
4	49	Hypertension	Acute urinary tract infection, 1915.	None	Cystocele
5	56	Chr. hepatitis.	Nocturia for yrs.	None	Normal
6	25	Periarteritis nodosa.	July 1939 urinary tract infection with *B. pyocyaneus* 5 wks. *B. coli* 1 month.	None	Normal
7	43	Partial bowel obstruction. Chronic cystitis.	Nocturia, dysuria and frequency for years.	None	Cystocele. Rectocele.

Hospital

| 1 | 36 | Hypertension. Chronic pyelonephritis. | Severe pyelonephritis, 1922 and 1936. | Following nephrectomy temp. elevated to 39° C. | Normal |

—Continued

	Results of Urine Cultures and Addis Counts		Remarks
Hosp. day	Organisms isolated (colonies per c.c.)	Pus cells Mill/24 hrs.	
2 5	Staph. albus (coag. −), 100,000 B. coli, 10,000,000	20	Died of hepatic insufficiency on 14th day. No treatment. No further studies.
2 9 12 18	B. coli, 3,000,000 B. coli, 100,000,000 B. coli, 3000 B. coli, 30,000	39	Treated. No further studies. Thyroidectomy done on 20th hospital day.
2 6 9 13 16 19 24 28 36 39 45 50	B. coli, 10,000,000 B. coli, 100,000,000 B. coli, 20,000,000 B. coli, 1,000,000 B. coli, 1000 B. coli, 1,000,000 B. coli, 5,000,000 Sterile Sterile B. coli, 10,000,000 B. cols, 10,000,000 Sterile	gross	Attack started acutely with chills, fever, nausea and vomiting. Treated. Cystoscope revealed a right ureteral stricture. Blood cultures were positive for B. coli the first week. She was discharged from the hospital on the 55th day. Urine culture in the clinic one month later was positive.

Transient Bacilluria

1 3 6	Proteus vulgaris, 10,000,000 Sterile Sterile	*	Primary disease caused constant gross pyuria. Patient died; postmortem showed normal tract.

Bacilluria Without Pyuria

1 4 9	Hem. strept. unidentified, 1,000,000 Hem. strept. unidentified, 1,000,000 Hem. strept. unidentified, 20,000	1 2	No symptoms, no fever, no pyuria. Pyelograms negative.
2 4	Hem. strept. unidentified, 1,000, Staph. albus (coag. −), 50,000, B. coli, 1000 Hem. strept. unidentified and Staph. albus, 50,000	5	No fever or pyuria. Pyelograms showed a stretched calyx on the left.
2	Staph. albus (coag. −), 1,000,000	1	No symptoms or pyelograms.

Organisms: Pyuria Mild or Absent

4	Staph. albus (coag. −), 11	3	No symptoms, no pyelograms.
6	Staph. albus (coag. −), 7	7	No symptoms, no pyelograms.
2 6	Strept. viridans, 12 Sterile	6	No symptoms, no pyelograms.
3	Strept. viridans, 100	9	Pyelograms negative. No symptoms.
2	B. coli, 100	1	No pyelograms, no symptoms.
1 4 7 13	Strept. viridans, 100 Sterile Sterile B. coli, 30	*	Patient had urine filled with formed elements from primary disease. No pyelograms.
1 3 14 17	Staph. albus, 18 Sterile B. coli, 3000 Staph. albus, 10	2 gross	B. coli and pyuria transient. Final culture showed Staph. albus in ureteral urine as well as in bladder.

Infections

2 5 29 36	Sterile Sterile Hem. strept. (Group B), 3,000 Hem. strept. (Group B), 10,000	4 16	Pyelograms revealed a small, functionless left kidney. Nephrectomy performed (18th day). Rt. kidney pelvis ulcerated.

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TABLE III

No.	Age	Primary Diagnosis	Past History Referable to Urinary Tract	Recent Urinary Tract Symptoms	Pelvis
2	45	Essential hypertension. Chronic glomerulo-nephritis.	None	Three days after cysto. and retrograde pyelograms, pyuria appeared. No fever.	Normal
3	33	Neurofibroma of spinal cord.	None	(1) One day after catheterization, temperature spiked. (2) Spontaneous rise of temp. to 40° C. 11 days post-op. (3) Spontaneous rise in temp. one month later.	Normal
4	50	Diabetes mellitus. Glaucoma.	None	3 days after catheterization.	Normal
5	65	Arteriosclerosis. Cardiac failure.	None	Two spontaneous attacks of fever and symptoms of urinary tract infection.	Normal
6	34	Diagnostic problem.	None	Pyuria and dysuria two days after catheterization.	Normal
7	61	Diabetes mellitus, diabetic coma.	No history obtained.	Chills, fever and dysuria on 10th hospital day.	Normal

positive culture was not more than three days in any case. Four cases had a urinary tract or systemic disease which seems definitely predisposing. A single case, a decompensated cardiac patient, developed an apparently spontaneous infection. Five of these patients were treated; from three of them serial cultures were obtained until the urine was sterile and on three of them supplementary urine studies were done.

BACTERIOLOGICAL FINDINGS

The summary of organisms isolated in all cases appears as table 7. Considering only the cases exhibiting bacilluria and pyuria on entry and those developing infections within the hospital (26 cases in all), Gram negative bacilli were isolated from 15 and Gram positive cocci from 12. *B. coli* was by far the predominant organism. It occurred in pure culture in 13 cases and in mixed culture in two cases. A Gram negative bacillus which produced the fermentation reactions of the paratyphoid group, but which was not serologically identified with any member of this group, was obtained in one case.

Gram positive cocci were isolated in 11 cases; *Staphylococcus albus* (coagulase negative) in pure culture in four cases and in mixed culture in three cases. In five cases from which Gram positive cocci were isolated initially there was a subsequent invasion or overgrowth of *B. coli*.

The bacteriology of the cases classified as transient bacilluria, bacilluria without pyuria and small numbers of organisms is not discussed because we

	Results of Urine Cultures and Addis Counts			Remarks
Hosp. day	Organisms isolated (colonies per c.c.)		Pus cells Mill/24 hrs.	
2 5	Sterile *Staph. albus* (coag. −), 1,000,000		2 38	Infection occurred 3 days after cysto. and retrograde pyelograms. Pyelograms showed anomalous renal pelves bilaterally.
1 2 14 45	Sterile Hem. strept. (unidentified), 30,000 *B. coli*, 1,000,000; Strept. in broth *B. coli*, 1,000,000; Strept. in broth		0 gross	Temperature elevated on day after entry. Second spike on 14th day (11 days post-op.) and third spike 1 month later. All attacks treated. No cultures and no pyelograms.
1 4	Sterile *B. coli*, 1,000,000		0 gross	No treatment or pyelograms + culture 3 days after catheterization.
1 15 20 27 32	Sterile *B. coli*, 10,000,000 *B. coli*, 50 Sterile Sterile		5	Spontaneous dysuria and frequency. Recurrence of dysuria and fever to 39° on 26th day. Treated.
1 3 4 6	Sterile *B. coli*, 50,000,000 *B. coli*, 50 Sterile		0 gross	Dysuria and frequency 1 day after first catheterization. Treated.
14 17 21 26	*B. coli*, 10,000,000 *B. coli*, 9,000 *B. coli*, 30 *B. coli*, 20		gross	No culture on entry. Spontaneous onset. Treated but discharged before cured. Bacilluria for 1 month after.

are uncertain of the significance of the organisms isolated. It is obvious from table 7 that Gram positive cocci predominated in these groups.

TREATMENT, SERIAL CULTURES AND SUPPLEMENTARY URINE STUDIES

Although this paper is not concerned with treatment of urinary tract infections we are interested in the number of patients who were treated after the discovery of a positive urine culture. We are also concerned with how adequately these cases are followed. Reference to table 8 will show a summary of cases treated, cases in which serial cultures were obtained until the urine was sterile and the number of supplementary studies performed. Of the 19 cases exhibiting bacilluria plus pyuria, 12 (63.2 per cent) were treated, four (21.1 per cent) were followed with serial cultures until the urine was sterile and five (26.3 per cent) had supplementary urinary tract investigation. Of the 37 cases which had a positive culture at one time or other (including all groups), 18 (48.6 per cent) were treated, nine (24.3 per cent) were followed with serial cultures and 13 (35.1 per cent) had supplementary urine studies.

DISCUSSION

This series of cases supports the impression that many women entering the Stanford Medical Service have urinary tract infections. The significance of cases presenting bacilluria without pyuria and of cases from which

TABLE IV

Comparison of Relative Findings in the Total Series, in Group I (Negatives) and in Group II (Bacilluria plus Pyuria). (Other groups not analyzed because of the small number of cases in each)

Cases in Group	Total Series		Total Negatives		Bacilluria + Pyuria	
	No. 100	% 100	No. 69	% 69	No. 19	% 19
Presenting complaints referable to G-U tract	3		0		2	
Past history obtained	97	100	68	100	18	100
Negative past history	39	40.2	29	42.7	7	38.9
Positive past history	58	59.8	39	57.3	11	61.2
Vague positive history	56	57.7	39	57.3	11	61.2
Nocturia	51	52.6	34	50.0	11	61.2
Other	22	22.7	13	19.1	9	50.0
Definite episodes	33	34.0	20	29.4	9	50.0
Single	21	21.6	13	19.1	5	27.8
Two	9	9.3	7	10.3	1	5.6
Multiple	3	3.1	0	0.0	3	16.7
Present illness obtained	97	100	68	100	18	100
Negative present illness	81	83.5	57	83.8	14	77.8
Positive present illness	16	16.5	11	16.2	4	22.2
Vague symptoms	13	13.4	11	16.2	2	11.1
Definite episode	3	3.1	0	0.0	2	11.1
Pelvic examination done	88	100.0	62	100.0	17	100.0
Negative	48	54.5	37	59.7	9	52.9
Positive	40	45.5	25	40.3	8	47.1
Pyelograms done	21	100	12	100	5	100
Negative	8	38.1	4	33.3	2	40.0
Positive	13	61.9	8	66.7	3	60.0

TABLE V

Findings on Pelvic Examination

	Total Series	Total Negatives	Bacilluria + Pyuria
Total Cases in Group	100	69	19
Pelvic Examinations Made	88	62	17
Negative Pelvic Examinations	48(54.5%)	37(59.7%)	9(52.9%)
Positive Pelvic Examinations	40(45.5%)	25(40.3%)	8(47.1%)
1. Diseases of cervix only	14	11	
2. General pelvic relaxation	2	2	
3. (2) + urethral abrasion	1		1
4. Prolapse of cervix	1	1	
5. Cystocele and rectocele	3	1	
6. Cystocele alone	4	2	2
7. Cystocele + (1)	1		1
8. Rectocele alone	2	2	
9. Urethral prolapse	1	1	
10. Urethral caruncle	1		1
11. Urethral polyp	1		
12. Rectovaginal fistula	1	1	
13. Bartholin's cyst	2	1	
14. Senile changes only	4	2	2
15. Pregnancy	2	1	1

TABLE VI

Possible Etiologies of Hospital Infections with Possible Predisposing Causes

Case No.	Supposed Etiology	Interval between Instrumentation and Infection	Possible Predisposing Renal or Systemic Disease
1	Post-nephrectomy	3 days	Chronic pyelonephritis
2	Post-cystoscopy	2 days	Anomalous renal pelvis
3	Post-catheterization	1 day	None known
4	Post-catheterization	3 days	Diabetes mellitus
5	Spontaneous	2 weeks	Decompensation cardiac
6	Post-catheterization	1 day	None known
7	Post-catheterization	1 day	Diabetes mellitus

only small numbers of organisms were cultured is not clear from this study. Such results might arise from low-grade infections, " transient bacilluria," or contamination.

The past history of the urinary tract is not of great value in making a diagnosis of urinary tract infection. At least one-third of all patients admit a history of one or more definite attacks of urinary tract disorder and there is no striking difference in the histories of those with positive and those with negative cultures.

The few patients presenting complaints of urinary tract symptoms at the time of entry and the scarcity of such symptoms elicited by questioning indicate that urinary tract infections may frequently be " silent." The positive ureteral cultures obtained from asymptomatic patients support the contention that even pyelitis may be of this order.

TABLE VII

Bacteriological Findings

	Bact. + Pyuria	Bact. − Pyuria	Trans. Bact.	Few Bact.	Hosp. Infect.
Gram (−) Rods	11		1	1	4
Pure culture:					
Atypical gram (−) rod	1				
B. coli communis	2				2
B. coli communior	5				2
Atypical B. coli	1				
Unidentified B. coli				1	
Proteus vulgaris			1		
Mixed culture:					
B. coli	2	1			
Gram (+) Cocci	9	3		6	3
Pure culture:					
Staph. albus (coag.-)	3	1		3	1
Strept. viridans				3	
Hem. strept. (group B)					1
Hem. strept. (group D)	1				
Hem. strept., unidentified	1	1			1
Non-hemolytic strept.					
Mixed culture:					
Staph. albus	3	1			
Streptococcus (viridans)	3	1			
Overgrowth by B. coli	4			2	1

TABLE VIII

Summary of Treatment, Serial Cultures and Supplementary Urine Tract Studies

Group	Cases in Group	Treated	Urine Cultured until Sterile	Supplementary Urine Studies
Bacilluria + Pyuria	19	†12(63.2%)	*4(21.1%)	5(26.3%)
Bacilluria − Pyuria	3	0	0	2
Transient Bacilluria	1	0	1	1
Minimal Bacteria, no Pyuria	7	1	1	2
Hospital Infection	7	5	3	3
Total	37	18(48.6%)	9(24.3%)	13(35.1%)

* 4 cases died or were transferred to another hospital.

† 3 cases were in extremis from a primary disease and were not treated.

The widespread impression that pelvic abnormalities, especially the re-laxation which accompanies advancing age and follows birth trauma, are predisposing to urinary tract infections is not borne out here. A much larger series of cases and more thorough pelvic examinations would be neces-sary to clarify this point.

It is obvious that cultural studies accompanied by controlled examina-tions of the urinary sediment are necessary for the detection of all urinary tract infections. Supplementary urinary tract studies are equally valuable for the determination of predisposing factors. For a clearer picture of the course of such infections and for a better appraisal of the treatment serial cultures are imperative. It would seem desirable that a second positive cul-ture of the urine be obtained from all cases before the institution of therapy.

The method of obtaining urine specimens for culture is important both to prevent contamination of the specimen and to avoid introducing bacteria into the bladder. The occurrence of six hospital infections following in-strumentation or catheterization emphasizes the need for particular care.

To avoid the occurrence of false positives a rigid laboratory procedure must be employed. Immediate inoculation of media will prevent false posi-tives resulting from the multiplication of a few contaminants. Liquid media are useful only when used in conjunction with solid media since growth in the broth gives no quantitative estimate of the bacterial flora in a given case. Recent studies of the bacteriology of the urinary tract indicate the value of enriched media. In routine laboratory studies of urinary tract infections quantitative counts of colonies are necessary.

The common practice of studying the urinary sediment of an unconcen-trated, untimed and frequently hours-old specimen, whether voided or catheterized, is certainly inadequate in any but grossly infected cases. The simplified Addis technic provides a rapid and accurate method for the quanti-tative determination of the formed elements of the urinary sediment.

In 1926 Hugh Young referred to the bacteriology of the urogenital tract as follows [14]: " The subject is one of extreme complexity, and little satisfac-

tion can be gained from a study of the literature. . . . Recently, the only thorough studies have been made on isolated species, the identification in large series being made on simple and conservative lines. Since many of the strains isolated do not correspond exactly with common organisms, it is obvious that more careful investigations should be made." We feel that this statement is as true today as it was 15 years ago.

That *B. coli* is the organism most frequently involved in urinary tract infections is in agreement with the majority of papers on the subject. However, in Young's series the Gram positive cocci were isolated more frequently than were the Gram negative rods. All of the staphylococci in our series were producers of white pigment and all were coagulase negative. This finding raises the question of the relation of bacterial virulence to the production of urinary tract infections. Young pointed out that the color of the pigment produced by a staphylococcus is no criterion of its pathogenicity and the majority of staphylococci isolated in his series were white pigment producers. Schulte has suggested the use of the coagulase test for determining the virulence of staphylococci and of animal inoculation for determining the virulence of all organisms recovered from the urinary tract. The failure to prove an organism virulent by these methods would not necessarily indicate an inability to produce urinary tract disease. Some ordinarily nonpathogenic bacteria are invasive in the presence of an obstruction or other pathological change in the tract.

The significance of streptococci in the urinary tract is debated. Young states that the organisms are commonly found in mixed culture and are frequently isolated from the urine of patients with no urinary symptoms. Lancefield [11] found that, with a single exception, only hemolytic streptococci of her Group A produced disease in man. Subsequent studies [15, 16] have implicated streptococci of Groups B and G in human infections and it is conceivable that under special circumstances members of other groups might produce disease.

Four cases in this series exhibited a secondary invasion or overgrowth by *B. coli* after an initial culture has been positive for only Gram positive cocci. Is it possible that *B. coli* is usually a secondary invader and that its presence in pure culture indicates a complete eradication of other organisms by its growth?

We feel that these urinary tract infections are worthy of more exacting and protracted study. The probable fundamental importance of the urinary tract to general health and to the diseases of later life is becoming more and more apparent. Schroeder and Steele [17] have recently found a surprisingly high incidence of abnormalities of the renal pelves and ureters in patients with hypertension. Since the incidence of such changes is high in the general population these findings may be incidental or they may indicate an etiologic relationship between the urinary tract pathology and hypertension.

CONCLUSIONS

1. Cultures and Addis counts were performed on the catheterized urine from 100 unselected cases on the women's medical ward.   The initial cultures from 69 women were sterile.   Nineteen cases exhibited bacilluria and pyuria; three cases, bacilluria without pyuria; seven cases, small numbers of organisms without appreciable pyuria.   One case had, apparently, a transient bacilluria.   Seven cases developed urinary tract infections during their hospital sojourn.

2. The high incidence of positive urine cultures in the population of a women's medical ward and the numerous definite attacks of urinary disorders in the past history obtained from these women suggest that urinary tract infections are more ubiquitous than has hitherto been emphasized.

3. If recent studies relating the occurrence of permanent renal damage and vascular changes to urinary tract abnormalities are confirmed, urinary tract infections deserve more careful study and treatment.

4. Since the history and physical examination of patients with urinary tract infections may so often be non-contributory, the diagnosis depends upon quantitative bacterial counts and controlled studies of the urinary sediment.

5. We suggest the following mode of approach to these cases: (a) routine Addis counts; (b) the use of only catheterized urine specimens for culture; (c) repeated quantitative cultures of the urine before the institution of treatment and periodically thereafter until the urine is sterile; (d) energetic treatment according to a definite plan; (e) supplementary investigation of the urinary tract after the urine has been sterilized; and (f) adequate follow-up for the discovery of recurrent infections and for the correction of anatomical abnormalities.

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INTERMITTENT LIMPING—INTERMITTENT CLAUDICATION; THEIR DIFFER-ENTIAL DIAGNOSIS *

By Isidor Mufson, M.D., *Bronx, New York*

The symptom " intermittent limping " has become so associated with intermittent claudication that clinically, to many, the terms have become almost synonymous. The term " intermittent limping " describes a sequence of events in which the patient finds repeatedly that, after walking a few blocks, he must come to a complete halt because of a cramp-like pain or sense of exhaustion in one or both legs. The first physician consulted usually refers the patient complaining chiefly of this symptom to a colleague particularly interested in peripheral vascular diseases. However, the complaint is frequently due to non-vascular causes.

An analysis of all such cases referred to us shows that often a closure of the peripheral vessels is found. At times more than one cause for the intermittent limping can be present, an endarteritis obliterans being only one of them, and at other times no arterial involvement can be disclosed. On this account, we believed that a review of the vascular and non-vascular causes for intermittent limping as found in our clinic, would lend emphasis to several points we believe helpful in differential diagnosis.

Locomotion in the adult is dependent upon a well balanced alignment of the osseous system and mobility of the articular surfaces. The musculature related to these bones and actuating the motion of their joints by its rhythmic contraction and relaxation, produces locomotion. The actuation and direction of this mechanism is dependent upon an intact and balanced nervous system. The need for increased nutrition to these parts while walking is at its height, requires a patent and elastic vascular system. A breakdown in the efficiency of any one of these three systems will interfere with the successful performance of the act of walking. A clonic contraction of the extensor muscles of the leg is an extremely effective method of bringing about and forcing such a rest period on the ambitious patient. The embarrassed part must rest to recuperate. A halting walk or limping follows.

Admittedly then, the symptom of intermittent limping alone is insufficient to make a diagnosis of obliterative vascular disease. The other systems may be at fault and a complete medical examination must be made to help clear up the question. If the findings are conclusive, their proper evaluation must be attempted; if indefinite, due to an early pathologic condition, the problem remains obscure. This is especially true if there is more than one cause for the intermittent limping. Our observations on the va-

rious causes for this symptom are discussed under their respective anatomical systems and form the basis of this report.

Muscle and bone imbalance in the leg and foot is a frequent cause of intermittent limping.   Because of its general prevalence it is often present in those suffering with vascular diseases.   This disturbance is most frequently produced by a shortened achilles tendon and gastrocnemius muscle.   It prevents full acute dorsi-flexion of the ankle.   This condition may be present on a congenital basis or acquired, as in women by the use of high heels.   The stress produced by the inability to dorsi-flex the foot while walking causes a severe spasm of the shortened calf muscles.   An imbalance of the metatarsal heads, which the gastrocnemius and soleus muscle use for a fulcrum in the forward motion of the leg, will strain the muscles and cause limping. Evidence of such a condition is found in the presence of uneven callus formations and roentgen-ray evidence of a short first metatarsal.

It is remarkable how patients obsessed for a long time with a fear of amputation, based on an improper diagnosis, will be relieved in 24 hours by simple " calf stretching " exercises.   A recently observed case illustrates this very well.   This patient, because of his 68 years and the rigidity of his vessels, and in spite of his normal oscillometric readings, had been considered to be suffering from a vascular disorder.   Previous treatment for this had made matters worse.   On examination, however, a marked shortening of the tendo achilles on both sides was found.   He was an actor and had tap-danced on his toes for many years.   Because of his failure to find work and having had to walk about town for months seeking employment, his gastrocnemius muscle had been overstretched and thrown into a clonic spasm.   Calf stretching exercises were prescribed and after a week the intermittent limping was cleared up.   The patient recognized the mechanism immediately and volunteered the information that for years he had done these exercises unconsciously because he found that they helped him in his work.

Another instance of this was seen in a woman who had been admitted to a local hospital for cardiac failure and auricular fibrillation.   While confined to bed she developed a severe cramp-like pain in her right leg.   The pulses in both dorsalis pedis arteries were difficult to palpate and the oscillometric readings were low.   In auricular fibrillation it is frequently difficult to evaluate the oscillometric findings because of the wide fluctuations in the timing and the force of the pulse.   However, it was thought that an embolus from the auricle had lodged in the vessels of her leg, not an unusual occurrence in auricular fibrillation.   Hearing this discussed at ward rounds, the patient immediately developed a severe anxiety neurosis.   She became hysterical and had to be sent out of the hospital.   When seen in consultation at home, the absence of active dorsi-flexion at the ankle gave the appearance of a foot drop.   However, passive motion also was found to be impossible because of an extreme contraction of the gastrocnemius and its tendon.   It took a great deal of time and persuasion to make the patient understand that she had no obliterative vascular disease and would not lose her leg.   All that she re-

quired was elevation of her heel so that the shortened muscle could not be pulled into a clonic spasm. The intermittent limping ceased.

For the proper coördination of the activities, muscles work in groups whose contractions are actuated by a single large nerve. A peripheral nerve lesion can therefore disable an entire group partially or completely, depending upon the degree of the injury. A group of muscles burdened with the work which should be carried on by its atonic neighbor will soon tire. Whatever the chemical agent generated by this exhaustion may be, the muscles become clonically spastic and locomotion is at once halted. Such a situation was found in a patient who was referred to us because it was thought she had claudication. On examination, instead of a diseased vascular system, the adductor muscles of the thigh were found to be paralyzed. The obturator nerve had become enmeshed and crushed by a malignant tumor in her pelvis. The vascular system was not involved. The case was one of intermittent limping because of the unequal distribution of work resulting from the failure of the adductor group to contribute its share.

In locomotion there is a synchronized contraction and relaxation of muscle tissue making for smooth progress. If the basal tonus of a resting calf muscle is increased by a pathologic condition and the stress of ordinary walking is then added to it, the summation of their energies will result in a clonic spasm of the overworked muscles. Such a hypertonicity can be brought about by the chemical disturbances causing tetany or the pathological changes present in extra-pyramidal and posterolateral column lesions. An illustration of such a chemical derangement recently presented itself in a patient whose complaint was intermittent limping, cold feet and edema of the legs. The arteries were not palpable and the oscillometric readings were low. Response to vascular therapy was poor, however, and the diagnosis was not clear. While under observation, a routine examination of the blood electrolyte partition was made for the explanation of vague symptoms. A low serum calcium was found. Further questioning and examination brought out the presence of a non-tropical sprue as a cause for the steatorrhea and loss of calcium. The coincident edema of the legs due to a low serum protein accounted for the difficulty in finding the vessels and the lowered oscillometric readings. The poor mental caliber of the patient which may have been due to a vitamin deficiency did not facilitate the medical examination. After appropriate treatment the edema cleared, the serum calcium rose and the walking tolerance was greatly increased as the tetany cleared.

The degenerative diseases which involve the extrapyramidal system and the lateral columns of the spinal cord have been found to be a frequent cause of intermittent limping. Of the cases we see these offer the most interesting problems in differential diagnosis. It should be apparent that the neurological signs are not advanced in character or the patient could not have been referred for intermittent claudication. The motor cells at the base of the brain in the hypothalamus and the neighboring nuclei produce stimuli which reënforce rather than initiate motion. Their involvement by a disease

process produces in the mild case, simply an increase in muscle tone and in the advanced case, a very marked rigidity of the muscles.   A case which falls into this group was seen recently.   This patient had a history of stomach trouble and intermittent limping for three years.   On examination, his peripheral arteries were not palpable but his oscillometric readings were normal.   His arteries probably ran an abnormal course.   Further examination disclosed a bilateral ankle clonus, hyperactive knee jerks and slight sensory changes, pointing to extra-pyramidal lesion.   The cause of his intermittent limping lay in the hypertonus emanating from the diseased basal cell nuclei. In this case, an old cranial trauma was probably the underlying factor.

Because their chief complaint is intermittent claudication we are frequently asked to see patients who have spinal cord disease.   These patients have a diffuse combined degeneration of the spinal cord known as posterolateral sclerosis.   This is an intrinsic degenerative disease of middle age which may appear coincidentally with sclerotic changes in the peripheral vascular system, a combination which makes for great uncertainty in differential diagnosis.   In addition to the hyperactive reflexes, the presence of the Babinski sign, ankle clonus and loss of position sense, there is a hypertonicity of the musculature which, in cases of extreme involvement, is characterized by what is called the scissors gait.   It is this increased tonus which, when the patient begins to walk, throws the calf muscles into a clonic spasm and brings him to a stop.   Such a patient was recently referred to us on account of intermittent claudication.   The lowered oscillometric readings seemed at first to confirm our impression that the complaint was entirely due to a partial arterial obstruction.   Complete examination, however, revealed sufficiently characteristic signs to warrant an additional diagnosis of posterolateral disease.   No free HCl after a histamine test meal was found. Treatment was at first directed to the vascular system but was without effect. After a change to a high vitamin diet and liver extract parenterally, the progress of the disease was at least limited and a trend to improvement was started.

Syringomyelia, with intermittent limping as the chief complaint, has also been encountered.   It mimics the intermittent claudication of endarteritis obliterans and the differentiation is rendered even more difficult because the patient states that his leg feels cold.   As the clinical picture becomes clearer, it becomes apparent that because of the loss of temperature sense, the skin of his affected leg is not conscious of its own surface heat, whereas the skin of the unaffected leg is conscious of it.

Intermittent limping by a patient who presents a pale leg with evident areas of soft tissue destruction and absent vessels is not a problem in diagnosis.   However, in this paper we are concerned with the border line case. It is irrelevant here whether the condition is one of endarteritis obliterans due to a non-specific infection or to arteriosclerosis.   The question is whether there is a patent arterial system and if not, is it so inadequate as to cause intermittent limping.   The first and simplest procedure is to feel for the

superficial arterial pulses at the ankle, in the popliteal space and at the femoral ring.   If absent, one must wonder if it is merely too difficult to find.   The dorsalis pedis artery is very frequently not present on the dorsum of the foot. The posterior tibial artery may be impalpable behind a prominent malleolus often found in people with squat feet.   Edema of the lower third of the leg also may hide the two vessels.   The popliteal artery, usually located just inside the mesial tendon of the gastrocnemius muscle, is frequently buried in fat or ephemerally felt in the patient who just cannot relax.   One can easily surmise that palpation alone is not enough, but the absence of any of these pulses is certainly provocative to further study.

The color of the skin, if the superficial circulation is patent, is dependent upon an adequate arterial blood supply.   Therefore, it may be made use of in finding out whether the arteries are adequate.   The leg is elevated, the foot flexed several times, rendering the skin colorless.   Lowering the leg to a dependent position would normally cause a prompt return of the pink color.   If there is a definite delay, the arterial blood supply is insufficient. However, it is also delayed when the skin is cool.   So for the test to be of value, the skin of the leg must be warmed in a whirlpool bath or by heating one of the other extremities not being studied.   The anxiety states of some people induce so resistant a vasoconstrictive reflex, that it takes a long time to dilate the subpapillary plexus.   The test is then useless for practical purposes.

The oscillometer measures the height of the pulsation of an artery.   Inasmuch as some of the factors which contribute to the makeup of the pulsation, namely, the mass of blood circulating, the velocity of the stream and the tonus of the vascular system, are the same for points equi-distant from the left ventricle, the variations in the readings of the oscillometer should give information concerning the structure of the artery underneath its cuffs. The membrana elastica, the medial wall and the diameter of its lumen will be the only factors under these circumstances.   The inability of these structures to yield to the systolic onrush of blood and to permit its free passage will result in a low pulsation and a low oscillometric reading.   If only one side is affected, then the uninvolved side may be used as a control.   If both sides are involved, then the standard for comparison must be that which experience has established for the particular instrument used.   In our clinic we have established for the lower extremities the standard of *three* for the lower third, *five* for the upper third of the leg and *eight* for the lower thigh. This instrument has been found to be of great importance in the study of a vascular problem.

The environmental and body temperatures will affect the oscillometer reading by varying the neuromuscular tonus of the arterial wall.   If the environment is cool, the reading is lowered because chilling contracts the lumen of the artery.   A whirlpool bath at 105° F. for 10 minutes will abolish such a spasm.   When there is a large difference in the oscillometric readings on both sides, and the lower reading is still within the normal limits, it must be

assumed, especially if there are symptoms present, that there is involvement of the questionable artery until proved otherwise.   This situation is not infrequently found and only after prolonged observation can a final conclusion be reached.

There are other methods of examination but these are more confirmatory in character and useful in determining not only the level of involvement, but also the prognosis.   In this field, we use the roentgen-rays to search for calcification in the vessels, and the skin temperature before and after warming or nerve block, the histamine wheal and the exhaustion or claudication time after muscle stimulation for further information.   An equally normal oscillometric reading on both legs is the most dependable sign of a competent peripheral vascular system.

Great mental strain is produced in a patient when he is informed that he has peripheral vascular disease.   He immediately sees an amputation in the offing.   Great care and restraint must be exercised lest unnecessary anguish be caused such a sufferer who comes in for intermittent limping not caused by claudication.

The complaint " intermittent limping " is a challenge to careful differential diagnosis.   It has been shown that especial attention should be paid not only to studies of the peripheral vascular system but also to the orthopedic and neurological systems.   Examples of these problems have been drawn from our experience in peripheral vascular studies on patients referred to us for consultation.   A growing consciousness of the problem has increased the percentage of cases whose complaint was really intermittent limping and not the intermittent claudication due to peripheral vascular disease.

PNEUMONIA AS IT MAY AFFECT YOUNG ADULTS: 300 CONSECUTIVE CASES AMONG STUDENTS AT THE UNIVERSITY OF WISCONSIN *

By Charles Everard Lyght, M.D., F.A.C.P., *Northfield, Minnesota,* and Llewellyn Rathbun Cole, M.D., F.A.C.P., *Madison, Wisconsin*

There is in evidence a growing appreciation of the fact that pneumonia is far from being a disease sharply limited within the confines of definite clinical specification. That pneumonia may be caused by a considerable variety of bacterial agents is well known, each organism endowed with different degrees of virulence, which, further, may fluctuate from time to time. So, also, is recognized the modification of symptoms and prognosis possible by quantitative pulmonary and hemic involvement, as well as by such qualitative factors as age, physical condition and individual resistance in the patient. As McKinlay[6] remarks, Bullowa and Wilcox[1] have well summed up the situation when they stress that the endemic pneumonias are a *series* of diseases, varying as to their occurrence from year to year and from month to month, and differing in respect to the age of the patient, incidence, mortality, tendency to invade the blood stream, and other characters.

Most papers on the subject of pneumonia concern themselves with the pneumococcal forms, usually depicting severe lobar involvement with a very high mortality, and, in recent years, proceeding to a discussion of the improved results obtainable through serotherapy and chemotherapy. Again, bronchopneumonia in children, the aged, the debilitated and the post-operative patient has been rather thoroughly described, as has now the aspiration pneumonia due to oils. Only a few writers have presented data with regard to pneumonia in relatively healthy young subjects. The majority of these last presentations have originated in college and university student health sources, probably due to the unparalleled opportunity possessed by clinicians in this field of medicine to observe impressive numbers of instances of acute respiratory illness, among which, inevitably, cases of pneumonia will be discovered.

We have been impressed with an apparent confusion in the minds of some of those who have written about student-age pneumonia, though it may have been rather a reluctance on their part to resort to the prevailing terminology and narrow standardization fashionable in the pneumonia field. At any rate, it has been manifested by a tendency to favor, almost apologetically, a nomenclature employing such terms as "atypical bronchopneumonia," " pneumonitis," and the like. It seems to us that there is nothing particularly atypical about the cases of pneumonia commonly observed in young adults

such as we propose to describe among our university students.   Instead, we feel there is a need to revise previous classifications and descriptions of so-called " typical " pneumonia, so as to guarantee inclusion of a very prevalent type of case.

At the University of Wisconsin, where the enrollment ranged from 7,500 to 10,000 during the regular session, and from 3,500 to 5,500 during the summer session, there occurred 368 cases of pneumonia in the eight years, 1931–1939.   Each year of record began July 1, and ended June 30, of the following calendar year.   The present study analyzes the data collected from the medical records of the first 300 consecutive cases in this series.   All the patients were university students, referred to the Student Infirmary, and there cared for by physicians of the Department of Student Health, assisted on many occasions by physicians from the staff of the State of Wisconsin General Hospital.

INCIDENCE AND EPIDEMIOLOGY

From mid-August until mid-September, when the University was not in session, and similarly during the Christmas and Spring recesses, there were virtually no students on the campus.   If this be borne in mind, it will be seen in table 1 that pneumonia was encountered in every month except

TABLE I

Incidence of Pneumonia by Month and Year

Academic Year	July	1st ½ Aug.	2nd ½ Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Total
1931–32	0	0	0	0	0	0	0	14	0	0	1	0	15
1932–33	0	0	1	1	5	6	5	2	0	0	0	0	20
1933–34	1	0	0	2	2	3	4	3	0	2	0	1	18
1934–35	1	0	0	3	3	5	5	1	6	3	4	8	39
1935–36	3	0	1	7	8	2	6	6	7	7	2	0	49
1936–37	1	0	2	5	9	6	4	0	1	2	1	0	31
1937–38	1	0	1	7	14	4	6	12	11	4	7	1	68
1938–39	2	0	4	26	38	22	8	9	13	3	1	2	128
Total	9	0	9	51	79	48	38	47	38	21	16	12	368*

* The first 300 consecutive cases are reported in this study.

August.   The disease tended to make its appearance in significant volume early in the autumn term, slackening off somewhat by Christmas, and showing a second surge upward after classes were resumed in January, this subsiding as spring advanced.   The academic year of 1931–32 was the sparsest in pneumonia, 14 of the total 15 cases occurring closely grouped in February. In fact, the first three years of this study showed a relatively low level of incidence of pneumonia and of all respiratory tract infections in general, while there was a gradual, steady rise in the figures for the last five years of the period, culminating in totals of 68 cases of pneumonia in 1937–38 and 128 cases in 1938–39.

A glance at figure 1 informs us that peaks in respiratory illness other than pneumonia were very closely followed in direction by the curve tracing pneumonia levels.   Totals in all categories reached their tops in the year 1938–39. We were not able to plot any consistent or significant relationship between the incidence of grippe-like affections on the one hand, and of pneumonia or other respiratory maladies on the other.   To us it seemed that this entity pursued a pattern all of its own, its outbreaks being annual, though not predictable as to exact seasonal occurrence, and with occasional moderate epi-

INCIDENCE, 1931-39:
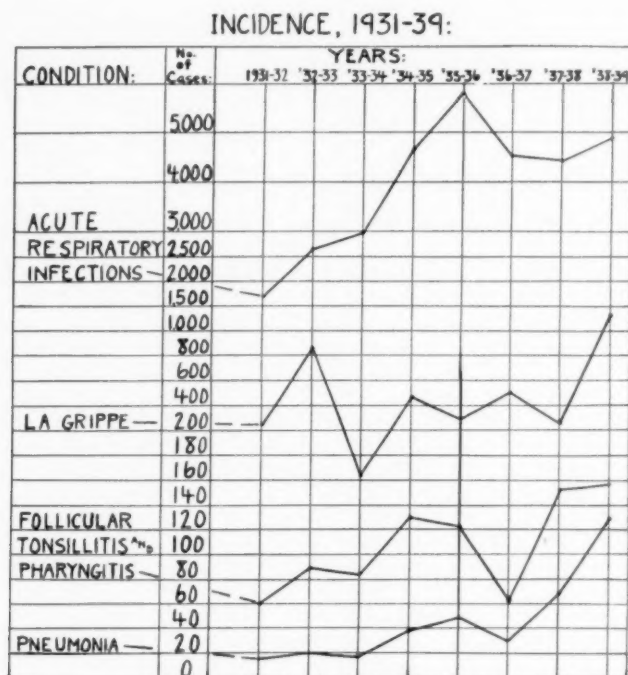
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demic proportions, as in 1932–33 and 1938–39.   We were unable to duplicate in our practice the experience of McKinlay et al.,[6] who reported that in years when influenza showed a rise, follicular tonsillitis had fallen off.

As would be anticipated, the vast majority of our patients were between the ages of 17 and 26 years, 280 being in that category.   Two were 16 years old, 12 between 27 and 32, one was 38, three 39, one 45 and one 49.   Average age for the group was 20.9 years.

There were 80 women and 220 men in the series.   All were white but one, a negro.   It may seem irrelevant, but we gained the impression, as we cared for the patients, that a rather large proportion were Jewish.   Final analysis revealed that 56 individuals, or 19 per cent, were Jews, in a student

community where the percentage ran hardly that high, being approximately 12 per cent.

The immediately recent medical history of our patients showed, as will be related subsequently, a large number of acute respiratory illnesses, out of which subjective pulmonary symptoms developed, or because of which the patients finally sought medical advice and care, and were then found to have evidence of pneumonia or to be in the process of developing it.

However, it is interesting to note that the truly past medical history revealed only 155 individuals with a completely favorable and uneventful back-

TABLE II

Past Medical History of Pneumonia Patients

		No. Cases
Group I—Reporting good health:		
Satisfactory, uneventful past medical history		146
Past medical history "fair"		9
	Total	155
Group II—Reporting one or more significant health impairments previously:		
	Total	145
		No. Instances
Frequent acute upper respiratory infections		73
Previous attacks of pneumonia		36
1 Previous attack	31	
2 " attacks	1	
3 " "	4	
Chronic paranasal sinusitis		22
Chronic rheumatic heart disease		8
Bronchial asthma		7
Chronic bronchitis		7
Recovery from recent acute illness		6
Chronic tonsillitis		5
Generally poor health, not itemized		5
Chronic bronchiectasis		4
Malnutrition		4
Previous acute pleurisy		3
Seasonal pollenosis, severe		3
Chronic otitis media		2
Diabetes mellitus		1
Pulmonary tuberculosis, minimal, arrested		1

ground of good or fair health.   No less than 145 young men and women, practically half the entire group, reported previous significant sickness or suffered from chronic conditions which operated as further health hazards. The most frequent of these handicapping conditions (table 2) was that of recurrent, usually severe, acute upper respiratory tract infection, while chronic paranasal sinusitis and other chronic tonsillar or respiratory ailments such as asthma, bronchiectasis or bronchitis added up to an impressive total. There were 36 students who had experienced previous attacks of pneumonia, five having survived multiple episodes.   Chronic rheumatic heart disease was observed in eight patients.

As Locke [5] has pointed out in experiments on animals, high " fitness " ratings increase the ability to survive pneumococcus infections, and low ratings have the opposite effect.   This being so, it seems probable that the same principle would apply to pneumonia caused by other organisms.   One might be led also to expect a lower infection rate among " fit " individuals in the first place.

Schwartz [10] collected a series of 654 pneumonia cases in which over half gave histories of upper respiratory infection prior to the onset of the disease, and more than one-third of his series presented evidence of important chronic lesions.   McKinlay and his coworkers [6] report as high as 74 per cent with preceding respiratory tract maladies in their patients with bronchopneumonia, whereas in Murray's [8] experience less than half had had a cold within three weeks of the diagnosis of pneumonia.

TABLE III

Anatomical Distribution of Pneumonia

A. 244 cases with single lobe involvement:

Lobe	Broncho-pneumonia	Lobar pneumonia	Lobe	Broncho-pneumonia	Lobar pneumonia
Right upper	13	1	Left upper	8	0
Right middle	5	1			
Right lower	100	4	Left lower	109	3
Total	118	6	Total	117	3

B. 56 cases with multiple lobe involvement:

Lobe	Broncho-pneumonia	Lobar pneumonia	Lobe	Broncho-pneumonia	Lobar pneumonia
Right upper	24	0	Left upper	11	2
Right middle	16	1			
Right lower	31	1	Left lower	30	2
Total	71	2	Total	41	4

C. Cases classed as bronchopneumonia　　　　　289
　　　"　　　"　　" lobar pneumonia　　　　　　11
　　　　　　　　　　　　　　　　　　　　　　　———
　　　　　　　　　　　　　　　　Total　　300

CLINICAL CONSIDERATIONS

It will be seen from table 3 that 289 of our cases were classed as broncho-pneumonia, only 11 other cases being diagnosed as lobar in nature.   It was our purpose in this communication to report all the pneumonia that occurred on the campus during the time selected for scrutiny, and not to limit ourselves to discussion of any special group, anatomic or etiologic.   Generally speaking, the cases here reported were of a relatively milder type than most series reaching the literature from large urban centers and General Hospital practice.   Therefore, the term " lobar " as applied to 11 of our patients is

based more on roentgenologic and physical findings than on any currently popular clinical concept of what constitutes lobar pneumonia. However, not all our pneumonias were mild, there being 11 deaths during the eight years, a mortality of 3.6 per cent, while many of those who recovered experienced a very severe illness throughout. Nine of the fatalities were doubtless traceable directly to the pulmonary disease, two others partially due to overwhelming illness co-existing elsewhere. During the time that we lost 11 patients by pneumonia, the total deaths at the Infirmary were 24, so that pneumonia, while a relatively mild disease in the mass, was the greatest single cause of death on the campus, accounting for almost half of all student fatalities, and well in excess of half of those deaths not due to accidents.

Table 4 lists the diagnoses made at the entrance of the patients to the Infirmary. The procedure was to refer the cases either from an office visit at the Clinic or from a house visit at the student's room. They were first

TABLE IV

Diagnoses as Recorded at Entrance to Hospital

	No. Cases
Group I—Pneumonia suspected by examining physician:	
Bronchopneumonia	43
" with la grippe	36
" " acute rhinopharyngitis	31
" " acute bronchitis	29
" , resolving	8
" with diaphragmatic pleurisy	3
" " chronic bronchiectasis	2
" " Vincent's gingivitis	1
" " acute tonsillitis	1
" " chronic sinusitis	1
" " scarlet fever	1
" " bronchial asthma	1
" " pleural effusion	1
Lobar pneumonia	8
	166
Group II—Pneumonia not suspected by examining physician:	
Predominantly "la grippe" type of diagnosis	93
" "acute upper respiratory" type	20
" "acute lower respiratory" type	11
	124
Group III—Pneumonia developed as a complication:	
Tonsillectomy	1
Repair of hydronephrosis	1
Cellulitis of head	1
Acute appendicitis; appendectomy	1
Furunculosis	1
Varicella	1
Acute follicular tonsillitis	1
Acute rheumatic fever	1
Acute purulent pericarditis	1
Subacute bacterial endocarditis	1
	10
	300

seen immediately upon admission by an interne, then by a resident, and finally by a staff physician attached to the Department of Student Health. Very ill cases were often examined by these doctors working in a group. Any diagnosis recorded by any of the medical attendants during the first day of the patient's stay in hospital or following his development of symptoms suggesting complication or exacerbation of illness for which he might already have been under treatment, was noted as an entrance diagnosis and will be found in Group I. It is observed that only 166 cases, or 55 per cent, gave a history or provided physical findings sufficiently positive to justify a provisional diagnosis of pneumonia at that stage. In Group II, 124 individuals were diagnosed as having la grippe, " influenza," or some form of respiratory tract infection short of pneumonia. In other words, pneumonia, if present at that juncture, was overlooked or was not ascertainable by routine methods. Ten cases in Group III are known to have been free of pneumonia on admission, but developed it while in the hospital for other quite distinct illnesses. Thus, we feel amply fortified by facts when we state that pneumonia in healthy young people is not simple or easy to diagnose at its onset, even when under the almost ideal conditions of closely checked physical examination obtaining in a well-staffed, modern hospital.

Smith,[12] in contrasting the dramatic onset of typical lobar pneumonia with that of typical bronchopneumonia, refers to the latter as " slithering into the picture of an ordinary bronchitis. . . ." The definitely insidious onset in many of our own cases is supported by entrance histories which inform us that only eight patients entered the Infirmary during the initial 24 hours of their illness. We had 169 cases, or 56 per cent of the series, who managed to report before they had been sick four days, but 68 others had been sick for five to 10 days before seeking medical assistance, and 23 others, presumably walking cases of pneumonia, had been ill or felt poorly for varying periods ranging from 12 to 28 days. During this time, they, like their short-sighted fellow patients, had tried to take care of themselves or had neglected their symptoms entirely. Finally, there were 10 patients whose pneumonia arrived to complicate unrelated conditions.

The clinical picture described in detail by various authors, notably by Murray,[8] by Miller and Hayes,[7] and by Smiley and his aides,[11] was well substantiated by our cases as well as by the figures just quoted. Generally the patient had felt unwell for a few days, noticing headache, usually frontal in type, general malaise, weakness and anorexia, backache, pains in the legs, cough, feverishness, occasionally mild chills, and frequently those coryzal or catarrhal symptoms customarily associated with a common " cold." Sudden, dramatic, explosive onset was a rare occurrence reserved to a few cases very ill at entrance. We have listed in order of their frequency the commonest chief complaints at entrance (table 5), and the commonest symptoms amassed from all symptoms reported in the history of the present illness as recorded by the internes. Cough heads both tabulations, though it is not a

TABLE V

Subjective Symptomatology

Chief Complaint at admission or onset:	No. Cases	All Symptoms at admission or onset:	No. Cases
Cough	94	Cough	245
General muscular aching	41	General muscular aching	183
Headache	36	Headache	166
Coryza	33	Feverishness	163
Chest pain	22	Chilliness; chills	151
Feverishness	19	Chest pain	114
Sore throat	19	Sore throat	95
Chills	16	Coryza	94
Weakness	4	Nausea and/or vomiting	34
Congestion in chest	4	Shortness of breath	16
Shortness of breath	3	Spitting of blood	11
Nausea and/or vomiting	3	Weakness	7
Spitting of blood	1	Congestion in chest	5
Pain in abdomen	1	Hoarseness	5
"Hives"	1	Diarrhea	3
Hoarseness	1	Dizziness	2
Diarrhea	1	Pain in abdomen	2
Sore foot	1	Miscellaneous, unrelated	11
Total	300		

universal admission symptom. Few cases experienced hemoptysis; hardly any had dyspnea, whereas over one-third had pain or discomfort in the chest. The largest single group comprised those who reported aches and pains usually occurring in connection with la grippe. (In view of the controversy concerning what should be labelled " influenza," we have tried to avoid loose use of this term, and in none of our cases was virus isolation attempted.) Next to cough, the predominant symptom, then, was that embracing some form of aching—muscular, frontal cephalic, ocular or substernal. A few cases began with conspicuously gastrointestinal rather than respiratory symptoms. Coryza and sore throat were complained of with about equal frequency, approximately one-third of the patients reporting them.

Upon physical examination, as already pointed out, something better than one in two patients showed findings suggestive of pulmonary consolidation. The commonly encountered findings included hyperemia of the nasal and pharyngeal mucosa, hypersecretion of mucus, and the presence of a purulent or mucopurulent secretion if the case had progressed that far. The eyes were often injected, the eyeballs tender to pressure. Slight cyanosis was common, with a flushed face, while marked cyanosis was infrequent. Perspiration tended to be profuse. The respirations were rarely much embarrassed. The patient impressed the examiner as being markedly uncomfortable, but not often as alarmingly ill.

Chest findings ranged from nothing significant at preliminary examination, through the group with well developed tracheobronchitis, up to those where a larger or more accessibly placed patch of consolidation was suggested, first by diminution of intensity of the normal breath sounds over an area, and later by the appearance of the classical signs of greater or less con-

solidated portion of lung tissue.   Râles, vesicular in type, often were not distinguishable at first examination, or perhaps only after cough.   Sometimes the fine type of râle was not heard at any time, and moist sounds were ascertained only as bubbling râles after resolution was under way.   Coarse râles often took many days to disappear.   Sputum, too, was very often lacking or extremely scanty during the larger part of the illness, and could be collected only when the pneumonic process was breaking up.   Usually it was thick and mucopurulent, seldom rusty or frankly bloody.

A SUMMARY of TEMP. ——   PULSE- - - - RESP. —·—·—
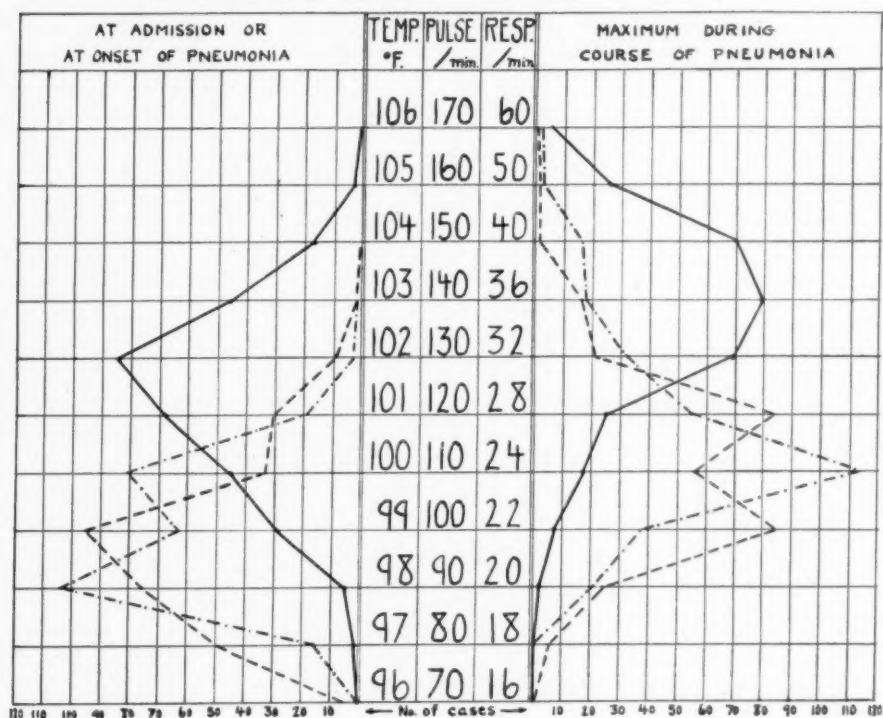
FIG. 2.

In figure 2, we have shown graphically the temperature, pulse and respiration of our 300 cases at the time of their admission to the Infirmary or at the time when pneumonic onset was evident or suspected.   It is seen that the initial fever was usually not high, most cases having a mouth temperature of 100° to 103° F., with the predominant number showing a temperature of 102° F. at entrance.   Typically, the pulse rate at that time was about 100 per minute, and the respiratory rate far from excessive, being generally from 20 to 24 per minute.   These data are in almost complete accord with those appearing in the reports by other investigators such as McKinlay,[6] Murray[8] and others.

Consulting the right-hand portion of figure 2, we see that later in the illness the temperature, pulse and respiration readings usually climbed somewhat higher, though unusually high levels were rare.   The pulse was not accelerated in proportion to the febrile response as a rule.   This was not merely a common finding, but also a good prognostic indication.   Most of the fevers at maximum lay between 102° and 104° F.; the relatively slow pulse rates centered at 110; and the respirations clustered between 22 and 28 per minute.

Four cases were completely afebrile during their stay in the Infirmary. Of the remaining cases, excluding the fatalities, 261, or 87 per cent, showed a return to normal temperatures by lysis, only 24 cases losing their fever by a definite, typical crisis.

Of the febrile cases, we have omitted from consideration those terminating fatally and seven others running a subsequent septic course due to some concurrent infectious process.   We found 55 per cent of the remainder had normal temperatures by the sixth day, 72 per cent by the eighth, and 93 per cent by the twelfth day in hospital.   A few cases, mostly because of some persistent complication or because of a delayed resolution, remained febrile until from 13 to 26 days had elapsed.

Though it had proved difficult to demonstrate pulmonary consolidation early by physical examination in many instances, in practically all cases it was possible at a later date to determine easily and accurately the presence of a resolving process by this approach.   Eight cases showed resolution phenomena upon admission, while by the sixth day 60 per cent of the recovering cases were in that state.   By the eighth day 79 per cent showed resorption taking place, by the twelfth day 88 per cent.   A straggling six cases took from 13 to 20 days to display resolving signs: three others were obscured by overlying fluid in the pleural cavity; one clinical picture was so confused as to make onset of resolution open to debate; and in 11 instances death supervened before the consolidation had started to dwindle.   Comparison of these figures for the sixth and eighth hospital days with those for the febrile status at identical periods reveals that discovery of physical signs pointing to improvement usually antedated by a few days the full resumption of normal figures on the nurse's chart.   After the tenth day, however, fever might be absent while a slowed resolution was only becoming evident to chest examination.

ROENTGEN-RAY FINDINGS

All our cases were thoroughly checked by roentgenograms.   Films totalling 993 were made upon the 300 patients.   These included 779 bedside studies made with a reliable portable machine at a 30- to 36-inch distance, and 214 films, most of them 72-inch stereoscopic plates, made later, on convalescent patients, in the Wisconsin General Hospital roentgenogram rooms. In some instances patients were fluoroscoped.

Exact comparison of ordinary physical examination results with the diagnoses made on a roentgen-ray basis is neither possible nor quite fair so long

as we are unable to report, as controls, how many other Infirmary patients during the eight-year period were suspected of pneumonia, roentgen-rayed, and found to be free of consolidation during the entire course of their illnesses.   However, our results are striking enough to serve as indisputable indicators that the film reveals a much higher percentage than does the stethoscope or other routine procedure based on changes in pulmonary and thoracic vibratory phenomena.   One is struck by the similarity between the relative merits of roentgenographic and stethoscopic examination in these early pneumonia cases and in patients with early pulmonary tuberculous lesions.

Preliminary physical examination, as stated above, led to a tentative diagnosis of pneumonia in 55 per cent of our cases (table 4).   Roentgen-ray studies confirmed this promptly in all but a very few instances where the first film failed to reveal a small or unusually situated patch and only repeated or extraordinary roentgenograms caught the shadow.   On the other hand, in the considerable Group II, where pneumonia was developing or was already well established but at so deep a site as to give insufficient physical signs to lead to a diagnosis, roentgen-ray examination was employed because the appearance of the patient, the history, the subsequent course, or the presence of pneumonia in the community made the examiner particularly sensitive to its possibility.   In these cases, the vast majority showed a pneumonic involvement as revealed by the very first film obtained.   In a few cases, where standard antero-posterior technic failed to disclose pulmonary consolidation, an oblique or a lateral view succeeded in doing so.   In this regard, it should be stated that very often pneumonic consolidations in the region of the cardiac shadow are missed on casual scrutiny of antero-posterior exposures.   A greater degree of patience, appreciation of anatomical and physical laws, and care in " unscrambling " the relative and frequently overlying densities in such areas will generally suffice to betray the presence of any unusual process disturbing normal lung aeration, and lateral roentgenograms may be then used as a means of corroborating the fact.

Briefly, roentgen-ray diagnosis of pneumonia of the types described represented our sheet anchor, whereas physical examination of orthodox limitations, no matter how careful, unhurried and competent, or how numerous were the examiners, was apt to prove less than adequate.   If these observations are supported by the experiences of other clinicians, it becomes mandatory that all severely ill respiratory cases deserve roentgen-ray examination of the chest.   We should be appalled, according to old standards, if a thorough chest examination were omitted.   Yet we are learning, by present standards, that a really thorough examination of the chest must include a roentgen-ray examination.   The drawbacks of expense and lack of proper facilities in many communities seem to be all that stand in the way of chest films being as mandatory as are less revealing but commoner laboratory procedures.

Anatomically, we have divided our cases into two groups, perhaps some-

what arbitrarily—those with involvement of a whole single lobe or less (244 cases), and those showing involvement of two or more lobes or parts of several lobes (56 cases). In this latter category there was involvement of two lobes in 42 instances, of three lobes in five, of four lobes in one, and of all five lobes in one case. Figure 3 pictures the frequency of involvement by lobes, indicating, as reported by other observers, that basal distribution of this variety of pneumonia is the most common. In our 244 cases with single lobe pneumonia, basal lesions outnumbered the others seven to one, while in those multiple lobe cases stemming from single lobe pneumonia primarily,

FREQUENCY OF INVOLVEMENT BY LOBES:

Tr.

R.U.L. 38

L.U.L. 21

R.M.L. 23

Br. Br.

L.L.L. 144

R.L.L. 136
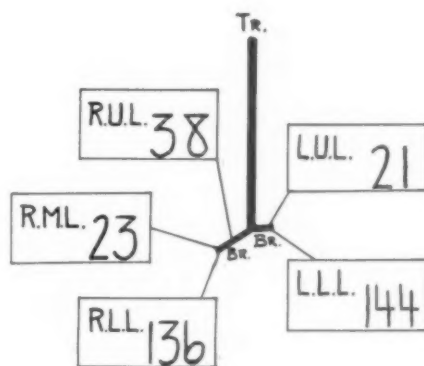
Fig. 3.

the usual experience was to find the initial consolidation in a lower lobe. The left or right lung was about equally often attacked in the single lobe cases, while multiple lobe cases seemed to demonstrate a predilection toward the more numerous lobes of the right side.

In appearance the typical pneumonic consolidation we observed first showed up on the roentgen-ray film as an ill-defined patch or zone of haziness, dependent for its density in large part on the stage in which we first examined and filmed the chest. Successive pictures would show usually a gradual, sometimes a more rapid, increase in the size and heaviness of the shadow if the disease were advancing, with a steady clearing of the area in surviving cases once resolution had begun. In most instances practically no evidence to suggest or locate recent pneumonia persisted, even in the most satisfactory films, four weeks after the onset of the illness. Often all traces had disappeared in three weeks. Last to go was the increase in the adjacent peribronchial markings, or occasionally a slight pleural thickening.

CLINICAL LABORATORY DATA

Our series of cases began at a time when the number of pneumococcal types ended with the old miscellaneous Type IV. Thus, well over half the sputum-producing cases had the benefit of none of the more detailed sputum typing studies to which cases later in the series were subjected. This should be recalled when examining table 6. Even so, it is safe to say that seldom

TABLE VI

Results of Sputum Examinations

(Sputum samples were obtainable in 235 of the 300 cases treated)

		No. Cases
A. Division of sputa:		
I. Sputa revealed recognizable organisms		131
II. " " no " "		104
	Total	235
B. Organisms reported identified:		
a. Streptococci, undifferentiated		56
b. Pneumococci		50
Type I	3 cases	
" II	1 case	
" III	3 cases	
Types IV to XXIX	21 "	
Type IV (old)	18 "	
Not determined	4 "	
c. H. influenzae		2
d. K. pneumoniae		1
e. "Gram-positive Diplococci"		4
" " " Cocci"		2
" " " Bacilli"		1
" " -negative Bacilli"		3
f. Mixed Group		12
Streptococci and Pneumococci	8 cases	
" " H. influenzae	1 case	
" " Gram-pos. Bac.	1 "	
" " " " Diplococ.	1 "	
H. influenzae and Pneumococci	1 "	
	Total	131

did this early restriction interfere with a reasonably satisfactory sputum analysis in cases such as we are reporting, due to two considerations. First was the relative infrequence of pneumococcal pneumonia. Second was the paucity of sputum in the vast majority of cases during the early days of their illness. What did appear was the preponderance of streptococci in the sputa that were obtainable.

In the 300 cases, we were able to secure one or more sputum samples in 265 instances. From 104 of these latter, the specimens revealed no recognizable organisms. Table 6 summarizes the results of laboratory studies on the remaining sputa of 131 individuals. It will be noted that streptococci, either alone or with other organisms, occurred oftener than any other bac-

terial form identified.   Next in order came the pneumococci.   Only in four cases were reports received that *H. influenzae* had been found.   Virus studies of nasopharyngeal washings, etc., as recommended by Reimann,[9] were not attempted in our series.

We did not consider sputum examinations satisfying or complete unless a determined search had been conducted to rule out the possibility of tubercle bacilli as the etiologic agent.   Of the 235 cases giving sputum, 229 supplied a total of 777 sputum samples, ranging from 1 to 11 per patient, and collected during the resolving stage of their pneumonia.   In no case were acid-fast bacilli observed to be present, several cases being additionally
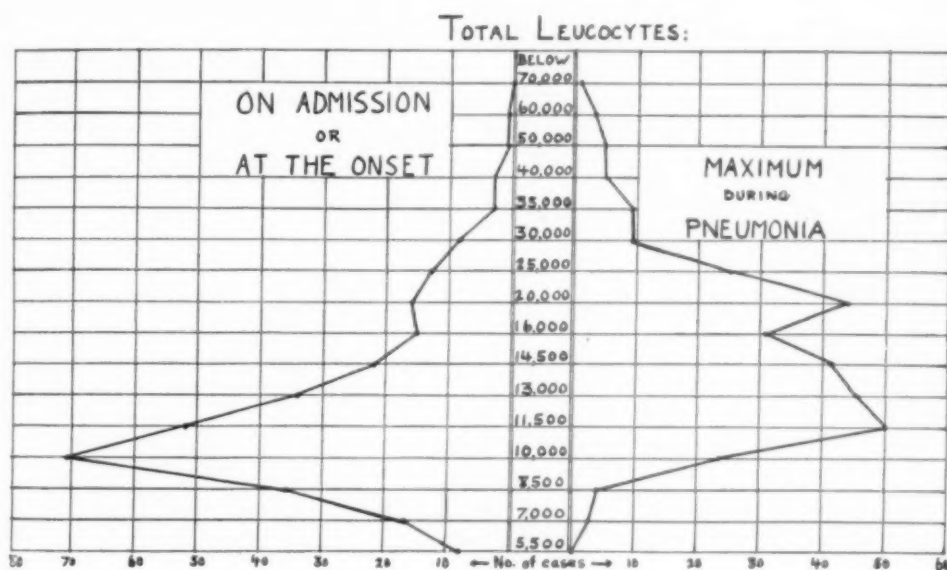
FIG. 4.

.checked by examination of fasting gastric contents.   During the eight-year span of 368 pneumonias, however, two cases of proved tuberculous bronchopneumonia did occur.   They were both omitted from the present statistics and report.

Red blood cell counts were not made on every case, but were done at intervals in the greater number, generally during convalescence.   A moderate degree of secondary anemia often developed, responding rapidly to appropriate corrective therapy.   We did not observe any severe anemias in our uncomplicated pneumonias.

Blood cultures were seldom deemed necessary, though they were carried out in approximately 30 cases.   Bacteremia was proved in one Type II and one Type III pneumonia, and in two fatal cases hemolytic streptococci were isolated.

Throat cultures were obtained in about 30 cases, usually those showing some degree of follicular tonsillar or pharyngeal involvement. Whenever the organisms were identifiable, they proved to be streptococci of strains similar to those found in the sputa.

Routine urinalyses, frequently run, gave us no consistent abnormal trends. A few cases displayed a transient albuminuria of mild nature, with occasional flurries of white blood cells, rarely a few erythrocytes. On two occasions we encountered a mild, acute, non-specific cystitis, and once an acute toxic nephritis that cleared soon.

DIFFERENTIAL WHITE BLOOD CELL COUNTS
AT
HEIGHT OF PNEUMONIAS
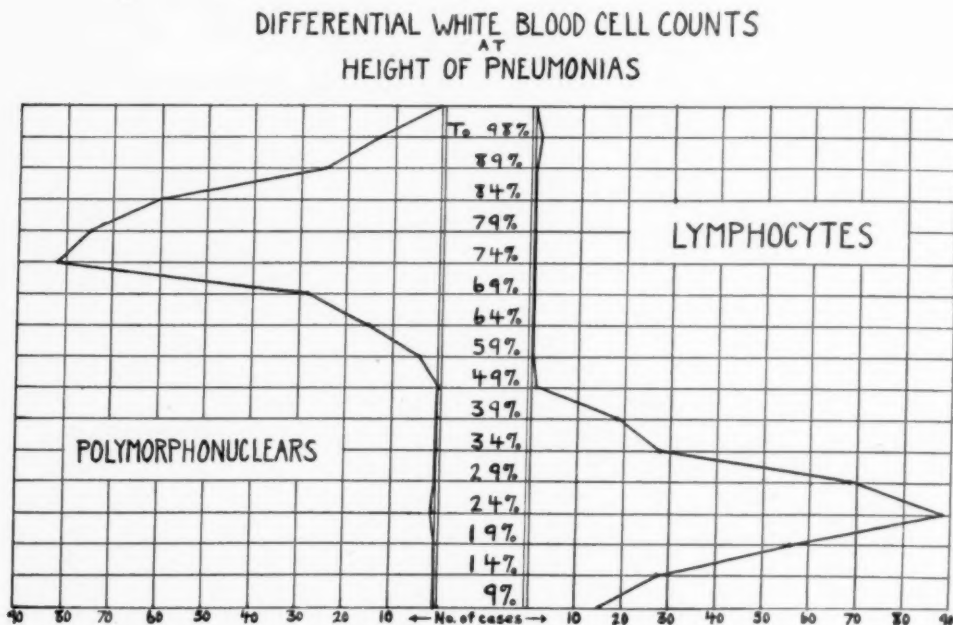
Fig. 5.

Total leukocyte and differential leukocyte counts were made upon admission to hospital and repeated at very frequent intervals during the illness and through the early portion of convalescence. In figure 4 we have shown, on the left, that the admission white blood cell count did not tend to be greatly increased, but favored the zone from 8,500 to 13,000, with more cases showing 10,000 leukocytes on entering the Infirmary than any other total. The right-hand side of the same chart reveals the expected heightened leukocytosis during the patients' most critical days of their pneumonia. Even then, however, the maximum counts were not, as a rule, very high when compared with severe lobar pneumonia determinations, grouping themselves largely in the 10,000 to 25,000 bracket. Murray [8] has drawn attention to " a curious rise in the count during convalescence, occasionally reaching 17,-

000 to 20,000." He goes on to remark that: "While this might be taken to herald the onset of some complication, none appeared in this group." Since he offers no theory to explain the phenomenon, perhaps we should say that we have observed this secondary rise in leukocytes in cases of pneumonia for many years, and, indeed, it was present in the greater share of the cases here reported. In our experience, barring the very occasional case in which it may indicate a late spread of the pneumonia or the occurrence of some complication, this secondary leukocyte peak has always accompanied the establishment and prosecution of the resolution process. We regard it as a very favorable sign, and have yet to witness our optimism as misplaced.

Figure 5 summarizes the differential white blood cell proportions of a typical specimen count at the time the pneumonic invasion was at its height and the patient at his sickest. Again, unlike the findings in cases of so-called typical pneumococcus pneumonia, the response in our patients was moderate rather than sweeping. The greatest number of cases had a count that read approximately: Polymorphonuclears, 70 to 85 per cent; lympho-cytes, small and large, 30 to 15 per cent. The chart shows that peaks jut out at about 74 per cent and 24 per cent respectively, the missing 2 per cent accounted for by rarer types of cells. Here again our figures are extremely close to agreement with those reported by others for this variety of pneu-monia among young adults.

COURSE AND PROGNOSIS

As stated before, there were 11 fatalities among 300 cases, nine of them due primarily to pneumonia. We can further break down our series into 234 cases in which no obvious complications occurred, 55 marked by one or more complicating factors, nine pneumonia deaths, one death due to subacute bacterial endocarditis, and one due to purulent pericarditis.

In the uncomplicated group, the average stay in the Infirmary was 18.8 days, 42.9 days for the cases suffering complications, and 8.2 days for those succumbing to pneumonia. These last cases died two to three days after the stage at which most other cases demonstrated that satisfactory resolution was under way. Lane [4] has reported a series in which, in bronchopneumonia of fatal termination, 41 per cent of the illnesses extended beyond one week. With regard to the number of hospital days for the uncomplicated cases, it should, of course, be remembered that these were students forced to face a rented room or a dormitory or a trip home in inclement weather following their discharge from bed care. Accordingly, we were most conservative in making certain that they stayed long enough to make their leaving reasonably safe.

The commonest complications in order of their frequency are listed in table 7. Pleural involvement, simple effusion, dry, or with empyema for-mation is seen to lead the roster, as also reported by Schwartz [10] and by

Kohn and Weiner.[3] Acute middle ear infection is in second place. Fatal issue is listed third.

TABLE VII

Complications Most Commonly Encountered

		No. Cases
Pleurisy		24
With simple effusion	15	
Dry	5	
With empyema	4	
Acute otitis media		14
Fatal issue		11
Acute paranasal sinusitis		7
Atelectasis; massive collapse		7
Acute follicular tonsillitis		4
Acute eustachian pyosalpingitis		4
Acute toxic myocarditis		3
Spontaneous pneumothorax		3
Markedly delayed resolution		3
Acute pericarditis		2
Acute nonspecific cystitis		2
Acute nephritis		2
Infectious mononucleosis		2

Deaths occurred in every one of the eight years except 1933–1934. The year 1937–1938 was marked by three pneumonia fatalities. Paradoxically, the greatest occurrence of complications in comparison with the number of pneumonia cases treated was in 1931–1932, the year when least pneumonia was seen on the campus. In that year there actually were more complicated than uncomplicated cases, and in two of the 15 cases death resulted. This bears out the observation of Bullowa and Wilcox [1] and others that mortality rates vary from year to year, along with the incidence of various types of organisms of fluctuating virulence.

TREATMENT

The therapy was very largely symptomatic and supportive. Serum was only occasionally used, partly because it was not often indicated, partly because of the lateness of recovery of sputum containing any demonstrable organisms, let alone type-positive pneumococci susceptible of serum treatment. In all, four cases received anti-pneumococcus serum, with questionable benefit in one case. Sulfanilamide was used in a small number of cases late in the series again with lack of more than occasional or supplemental benefit. Certainly, there were no dramatic recoveries attributable to the use of drugs in the sulfonamide group. This observation has since been corroborated by the experience of one of us at another college in dealing with cases of student pneumonia during the past five winters.

Codeine for cough, morphine for pain, restlessness and fright were decidedly helpful. Forcing of fluids was a routine procedure except when rarely or temporarily contraindicated. In our opinion, mustard as a counter-

irritant was appreciated both by the patient and the doctor, relieving pain and chest tightness in most instances.   We employed hot packs or warm turpentine stupes to the abdomen in the occasional cases where abdominal distention was a problem.   Enemata were useful, but were of the mild soda-saline variety, often preceded by an oil retention enema overnight, and always reserved as an emergency procedure so as not to exhaust a patient already fully occupied in battling a treacherous disease.

Oxygen therapy was not reserved for late or overwhelming emergencies. We employed it liberally to allay such exhausting symptoms as severe cough and dyspnea of neurogenic origin, as well as to combat the infrequent cyanosis and true air-hunger.   We found oxygen often relieved otherwise ungovernable headache, especially in those patients not tolerating codeine well.   As Jonxis [2] has emphasized, hypoxemia is not necessarily associated

TABLE VIII

Surgical and Other Procedures Necessary during Pneumonia

	No. Cases
Paracentesis of thorax, diagnostic	15
Transfusion of blood	5
Paracentesis of auditory tympanum	5
Rib resection; thoracic drainage	3
Incision of abscess	2
Antrum puncture	1
Thoracoplasty, 3-stage	1
Mastoidectomy, bilateral	1
Paracentesis of pericardium (4 times)	1
Pericardotomy	1
Appendectomy	1
Extraction abscessed tooth	1
Ligation right jugular vein	1

with marked cyanosis.   We administered oxygen by the nasal catheter method, generally under the direction of Waters and his associates.   This method was not only well borne by our patients, but was easy, economical and effective in the hands of our staff.   In most cases the gas was supplied uninterruptedly at the outset, later only at those times when some symptom or the patient's attitude necessitated its use.   In addition to the 11 fatal cases, oxygen was used on 42 other individuals, always with favorable results. In a few cases it proved to be the only therapeutic agent capable of controlling extreme paroxysms of cough.   Oxygen was employed during part or all of 333 separate days, averaging 6.3 days per case receiving it.   We consider oxygen, after the fundamentally necessary bed rest, as our greatest single ally and comfort-providing agent in treating the type of pneumonia under discussion.

Seldom were surgical procedures necessary, though when need did arise they ranged all the way from a diagnostic pleural paracentesis up to rib resection or jugular ligation.   These interventions are listed in table 8.

SUMMARY

1. Reported are 300 consecutive cases out of a total 368 cases of pneumonia occurring among students at the University of Wisconsin, Madison, during eight academic years beginning July 1, 1931, and ending June 30, 1939. All cases were treated at the Student Infirmary.

2. Relation to other types of respiratory illness is discussed. The kind of pneumonia predominating in this series seems more closely linked to acute respiratory tract infections than to any other type of illness.

3. The symptomatology, physical findings, course, complications, prognosis and treatment are summarized. Specific therapy was not generally practiced. The value of oxygen therapy is stressed.

4. Roentgenographic and clinical laboratory data are presented and typical findings discussed.

5. A mortality rate of 3.6 per cent is reported.

CONCLUSIONS

1. Pneumonia occurs frequently in a mass of young adults such as a university student body, among whom acute respiratory infections are the chief cause of morbidity.

2. Pneumonia in such a group carries a low mortality due to the high general health level in the ages and the social stratum concerned, the fairly low virulence of the average infective agent encountered, and the prompt and effective diagnostic and therapeutic services available. Such factors should be envisaged when results of serotherapy, chemotherapy or other treatment involving young adult pneumonia cases are reported.

3. Though the mortality rate is low for pneumonia, 3.6 per cent, this disease accounts for more fatalities on the campus than any other cause of death.

4. Streptococci lead as the causal organisms found, followed by pneumococci usually of low virulence.

5. Roentgen-ray examination greatly excels less penetrating methods of pulmonary examination.

6. The form of pneumonia described can be considered common among the group observed, and compares closely with similar studies reported by recent and contemporary observers of related groups. Therefore, it seems unnecessary and unwise to label this as an "atypical" pneumonia, or to coin terminology that suggests a process not covered by the thoroughly adequate word pneumonia.

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HEMORRHAGIC PLEURAL EFFUSION; AN ANALYSIS OF 120 CASES *

By KURT BERLINER, M.D., *New York, N. Y.*

FEW papers have been written on the subject of hemorrhagic pleural effusion during the past 10 years. There are discussions of the subject which are part of an exposition of single underlying diseases.[1] There are other discussions of hemorrhagic pleural effusion which limit themselves to its occurrence in children.[2, 3] But there is no comprehensive study of the entire subject except chapters in textbooks on diseases of the chest [4, 5] which, however, fail to give the sources for their conclusions. Views expressed in the older literature [6, 7] are now open to question in the light of our better knowledge of various diseases, particularly carcinoma of the lung.

For these reasons, it was decided to make a statistical investigation of hemorrhagic pleural effusion to determine the relative frequency of the underlying diseases. The present paper reports the results of this investigation. It is based on the varied case material of a large general hospital. The series reported here includes the more common types of hemorrhagic pleural effusion, and it also includes a number of cases of unusual etiology which seemed of sufficient interest to warrant detailed discussion.

The clinical records of all patients treated for diseases of the pleura on the wards of the Mount Sinai Hospital during the 11 year period 1928 to 1938 were examined, and 120 cases of hemorrhagic pleural effusion were found. An autopsy was performed on 33 of the patients. In each of the 120 cases, the evidence for the diagnosis of the underlying disease was critically analyzed. Note was also made of the amount and character of the pleural fluid. Where cytological and bacteriological examinations of the effusion had been made, their results were also recorded.

A pleural effusion may be called hemorrhagic if it contains an admixture of blood large enough to be seen macroscopically. It is by no means unusual to find microscopic amounts of blood in a serous pleural effusion of simple inflammatory origin; but the number of red blood cells is too small to cause a change in the color of the effusion. Dieulafoy [7] found that the presence of 1000 to 3000 red cells per cubic millimeter caused no appreciable change in the color of the fluid, but that 5000 to 6000 red cells per cubic millimeter imparted a rosy tint to the fluid. My observations confirmed Dieulafoy's statement. In 18 cases, a red cell count of the fluid was done. In most of these, the number of erythrocytes far exceeded 6000 per cubic millimeter. In three cases, however, there were fewer, 1500, 2000, and 3080 respectively, and yet the fluid was described as slightly serosanguinous. The color of

the fluid was usually brownish or amber—produced, no doubt, by changed hemoglobin from laked cells. A rosy tint was more often found as the result of needle puncture, where fresh blood was admixed.

On the other hand, if pure blood, not a serosanguinous fluid, fills the pleural cavity, we no longer speak of a hemorrhagic pleural effusion, but of a hemothorax. In the present study, there were only seven cases in which " pure blood," " old clotted blood," or " chocolate colored material " was aspirated from the pleural cavity. In all the remaining 113 cases, a true effusion was found; this was serous, with a varying admixture of blood leading to such descriptions as " blood-tinged " or " serosanguinous." All traumatic cases of hemothorax, such as those resulting from stab wounds or other chest injuries, were excluded from this series.

Spontaneous Hemopneumothorax. Six cases of spontaneous hemopneumothorax * seen on the wards during 1928 to 1938 were likewise excluded from the statistical analysis, but will now be briefly discussed. In one of the six, inoculation of a guinea-pig showed tuberculosis to be the underlying disease. This patient recovered. The remaining five were of the so-called idiopathic type, and were presumably due to rupture of subpleural blebs. Four of these five patients recovered; one died, and necropsy revealed numerous subpleural blebs. A characteristic finding in all six cases was the hemoglobin content of the aspirated fluid which was high compared to that found in hemorrhagic effusions. In one instance, it was as high as 80 per cent at the outset, but gradually dropped to 5 per cent. The only conceivable explanation for the drop is that the bulk of the blood in the pleural cavity coagulated and more and more red cells were caught in fibrin. Slow clotting of the aspirated fluid was another significant observation made in these cases. It is explained by the transformation of available fibrinogen into fibrin within the pleural cavity. The differential white cell count of the aspirated fluid was done in two of the six cases. In one, it showed 70 per cent polymorphonuclears and 30 per cent lymphocytes, which was practically identical with the differential count of the patient's blood. In the other case, the count revealed 16 per cent polymorphonuclears.

After a spontaneous hemopneumothorax has existed for some time, and frank bleeding has ceased, the character of the pleural contents is apt to change. The clotted blood may act as an irritant on the pleura and may lead to exudation of serous fluid and lymphocytes. This exudate may dilute the blood and eventually the pleural contents may appear to be serosanguinous. At that stage, it may no longer be possible to make the distinction between hemorrhagic pleural effusion and hemopneumothorax.

Bleeding as a Result of Needle-Puncture. Special care was taken to eliminate those cases in which the bloody admixture appeared to be the result

* In one of these, the presence of air could not be demonstrated. Since the paper was submitted for publication, this patient has developed signs of rheumatic heart disease, pericardial effusion, and bilateral pleural effusion. The correctness of the original diagnosis, therefore, may be questioned.

of trauma, during aspiration of the chest.   The bloody character of the effusion, in the great majority of cases, was unquestionably not the result of such trauma.   In numerous instances,* one or more repetitions of the thoracocentesis proved this by yielding the same type of exudate each time.

Cases where the aspirating needle had punctured a vessel were usually easy to recognize.   In such instances, only the first few cubic centimeters of the exudate appeared bloody, the large remainder was serous; or aspiration first yielded a large quantity of clear, yellow exudate, and toward the end of the procedure, fresh blood suddenly appeared, usually after the needle had been manipulated.   The probability of puncture of the lung is great when the effusion is very small, so that no significance should be attached to the finding of blood, when only a few cubic centimeters are aspirated.   Therefore, cases in which only small amounts of bloody fluid could be obtained on aspiration, were excluded from this series.

Effusions Due to Malignant Neoplasms

Neoplasms of the pleura were found to be the most frequent cause of hemorrhagic pleural effusion.   Seventy-eight of the 120 patients suffered from malignant neoplasms (65 per cent).   To that extent my figures confirm the opinion commonly held that the finding of a hemorrhagic effusion is strongly suggestive of neoplastic disease.   Forty-two of the 120 cases, however, were found to be due to other diseases.   In other words, every third case was *not* due to neoplasm.   It is necessary to bear this in mind when dealing with a case of hemorrhagic pleural effusion.   To assume at once that such an effusion is caused by a neoplasm, is a serious error.

The evidence for the diagnosis of malignant neoplasm was carefully analyzed in each case.   This diagnosis was proved by postmortem examination in 19 cases, by biopsy in 28 cases, and by the finding of tumor cells in the pleural fluid in 17 cases.   In 13 cases, indirect evidence for the diagnosis was accepted, namely characteristic clinical or roentgen features in conjunction with fatal issue in nine cases, and definite physical or roentgen-ray signs of other metastases without proof of fatal issue, in four cases.   One case was included although there was no definite proof of the existence of metas-

* Fifty-three out of 78 cases of hemorrhagic pleural effusion due to neoplasm had more than one aspiration.   In 10 of these, the fluid obtained was serous at the first aspiration, and serosanguinous later.   These were cases in which the possibility of bleeding due to needle puncture had to be considered.   In the remaining 43 cases, the fluid was serosanguinous from the first aspiration.   In 39 of these 43, the character of the pleural fluid was the same on subsequent aspirations as on the original one.   In 4 cases, there was a change; serosanguinous fluid was found at the first thoracocentesis, serous fluid at a subsequent one, and again serosanguinous fluid at a still later one.   In these four cases, the bloody admixture to the pleural fluid was certainly not due to needle puncture.   Such changes in the appearance of the fluid may rather be explained as a result of repeated hemorrhage into the pleura, an event which is occasionally seen in the course of a pleural neoplasm.   Not once did we see a case where serosanguinous fluid was obtained at the first aspiration, but clear serous fluid at all subsequent aspirations.   This fact also seems a good argument against the assumption that the blood in some of the pleural effusions which were tapped only once, might have been due to needle puncture.

tases and no knowledge of fatal issue, because other clinical features were definitely indicative of neoplasm.

Primary Pleural Neoplasms. In only one of the 78 cases was the tumor a primary neoplasm of the pleura. This was a case of mesothelioma of the pleura, proved by postmortem examination. It was accompanied by a recurring massive serosanguinous effusion. The fluid had a specific gravity of 1.015 and contained only 900 white blood cells per cu. mm., 96 per cent of which were lymphocytes.

TABLE I

Underlying Condition of Hemorrhagic Pleural Effusion—120 Cases

Malignant neoplasms	Tuberculosis				Miscellaneous inflammatory conditions						Pulmonary embolization	Pelvic fibromatous tumors	Lymphatic leukemia	Lymphogranulomatosis	Uremia associated with cardiac failure	Cause undetermined
	"Idiopathic" effusions	Chronic pulmonary tuberculosis	Polyserositis	Laennec's cirrhosis	Sepsis	Lobar pneumonia	Bronchopneumonia in luetics	Bronchopneumonia in non-luetics	Lung abscess	Polyserositis						
	4	1	2	1	4	2	2	2	1	2						
78	8				13						10	2	2	1	1	5

Metastatic Pleural Neoplasms. The remaining 77 cases of malignant disease were found to be due to metastatic neoplasms of the pleura (table 2). Fifty-one of these 77 cases were histologically proved to be carcinoma, 10 were different types of sarcoma.* In 16 cases, the exact type of tumor was not histologically determined.

In each case, an attempt was made to find the location of the primary neoplasm which had metastasized or extended into the pleura. The primary

* Four of these were lymphosarcomata, and one a myelosarcoma.

TABLE II

Types of Neoplasm Underlying Hemorrhagic Pleural Effusion in 78 Cases

	Primary Pleural Neoplasm	Metastatic Pleural Neoplasms						
	Meso-thelioma	Carcinoma	Neoplasm of unde-termined type	Sarcoma	Lympho-sarcoma	Angio-sarcoma	Fibromyo-sarcoma	Renal neoplasm
No. of Cases	1	50	15	4	4	1	1	2

lesion was found in the lung more often than in any other organ. Thirty-one of the 77 metastatic cases were proved to be due to primary neoplasms of the lung. In eight additional cases, it was not possible to determine the site of the primary tumor with certainty, but an analysis of the clinical and roentgenological features made it appear very probable that the primary lesion was in the lung. In any event, no more than 39 of the 77 cases, i.e. half, were cases of primary pulmonary neoplasm. It is noteworthy that in none of these 39 cases was the effusion bilateral.

In the other half of the cases, the primary tumor was situated in various other organs (table 3). In 10 patients, the site of the primary tumor could

TABLE III

Site of the Primary Tumor in 78 Cases of Hemorrhagic Pleural Effusion Due to Malignant Neoplasm

	Pleura	Lung	Probably in lung	Breast	Mediastinum	Colon	Kidney	Tonsil	Other viscera	Unknown—probably in viscera other than lung
No. of Cases	1	31	8	8	13	2	2	1	2	10

not be determined, but it was probably situated in viscera other than the lungs. A conclusion of practical importance may be drawn from these figures: in every case of unilateral hemorrhagic effusion which is suspected of being of neoplastic origin, it is appropriate to begin the diagnostic studies with an investigation of the lung.

Size of Effusions Due to Neoplasm. Pleural effusions due to neoplasm, as is well known, are often of very large size, covering the lung from apex to base and failing to show evidence of absorption. In our series, 60 of the

78 cases of neoplasm had such large effusions, each yielding more than 1000 c.c. on aspiration; several were of huge size, requiring many aspirations and yielding 10,000 c.c. and more of fluid. Only nine effusions were of small size, less than 500 c.c. being obtained by thoracocentesis in each of them. The effusion was bilateral in eight, right-sided in 34, left-sided in 36 cases.

Character of Fluid. In 71 of the cases of neoplasm the aspirated fluid was serosanguinous; in seven cases, however, it was described as " pure blood," " thick blood," " old, clotted dark blood," " dark brown old blood." In one of these seven cases, the fluid changed in character. At first, pure blood was obtained in large quantities on several aspirations; a few weeks later the fluid became serosanguinous. Frank hemorrhage into the pleura from a tumor is not a very unusual occurrence. On the other hand, in the non-malignant cases, pure blood was never found in the pleural cavity, except in cases of spontaneous hemopneumothorax.* It seems justifiable to infer that the finding of pure blood in the pleural cavity limits the differential diagnosis to two conditions: spontaneous hemopneumothorax and neoplasm of the pleura.

The specific gravity of the pleural fluid was examined in 43 cases. It was found to range between 1.010 and 1.030, with an average of 1.017. In the large majority (29 cases) it was 1.015 and above. In only three cases it was below 1.012.

Cytological Examination of the Pleural Fluid. This included a red cell count, a white cell count, a differential count of the leukocytes, and a search for tumor cells. In two of the cases where " pure blood " was aspirated, the hemoglobin content of the fluid was also estimated. It was 28 per cent in one, and 35 per cent in the other.

In 34 cases, the leukocytes were counted. The average number was 3200 per cu. mm., but the number varied from 60 to 19,700. In 19 cases, the leukocyte count was 1000 or below. Here again, it should be borne in mind that such cell counts are not always reliable, particularly if the fluid has begun coagulating. In that event, only the supernatant fluid may have been examined, whereas the majority of the cells were caught in the clot.

A differential count of the leukocytes in the fluid was made in 34 of the 78 cases of pleural neoplasm. In the majority of these, the leukocytes were almost all lymphocytes, in spite of the fact that the effusions were hemorrhagic. That lymphocytes usually predominate in cancerous effusions does not seem to be generally known, for Norris and Landis [4] write: " An excess of lymphocytes in the fluid is very suggestive of tuberculosis." Only 12 of the 34 cases showed more than 15 per cent of polymorphonuclears. It was also apparent that the percentage of polymorphonuclears varied with the amount of blood admixed with the fluid. In the few cases where the pleural contents resembled pure blood, the percentage of polymorphonuclears was very high. In some of these the differential white cell count in the pleural

* With one exception; see the first footnote.

fluïd approximated the differential leukocyte count in the patient's blood. Two effusions in which the white cell count was very high, 18,400 and 19,700 respectively, contained a high percentage of polymorphonuclears, 55 per cent and 95 per cent.

Examination for Tumor Cells. In 70 of the 78 cases of neoplasm, the pleural fluid was examined for tumor cells by the paraffin section method of Mandlebaum.[8] In 35 cases (50 per cent), tumor cells were found. In 17 of these, the finding of tumor cells was the only available proof for the diagnosis of neoplasm. If primary mediastinal neoplasms are omitted, the percentage of cases in which tumor cells were found becomes higher, namely 55 per cent. In 25 of the 35 positive cases, tumor cells were found at the first examination, in five at the second, in three at the third, and in two at the fourth. In 35 of 70 cases examined, tumor cells could *not* be found in the pleural fluid, the diagnosis being established by other means. Nearly half of these failures, 17, occurred in patients who had only a single examination of the fluid. Had they had several more examinations, tumor cells might still have been found in some of them.

TABLE IV

Hemorrhagic Pleural Effusions Due to Malignant Neoplasm; Frequency of Finding of Tumor Cells in Pleural Fluid

Site of primary tumor	Pleura	Lung	Probably in lung	Breast	Mediastinum	Colon	Kidney	Tonsil	Other viscera	Unknown—probably in viscera other than lung	Total number of cases	Cases examined for tumor cells
Number of Cases	1	31	8	8	13	2	2	1	2	10	78	70
Tumor cells found in fluid	0	17	5	6	3	0	0	0	0	4	35	50% positive
Tumor cells not found in fluid	1	13	3	1	8	0	2	0	2	5	35	50% negative
Fluid not examined for tumor cells	0	1	0	1	2	2	0	1	0	1	8	

Table 4 shows that the frequency with which tumor cells were found varied with the location of the primary neoplasm. With the primary tumor situated in the mediastinum, tumor cells were found in only two out of ten cases examined (20 per cent). This low incidence contrasts with the much higher percentage of positive examinations for tumor cells in the neoplasms originating elsewhere. When the primary tumor was in the breast, tumor cells were found in the pleural fluid in six out of seven cases examined. When the primary tumor was in the lung, tumor cells were found in 22 out of 39 cases.

The amount of blood admixed with the pleural fluid did not seem to affect the frequency with which tumor cells were found.   Where the aspirated fluid consisted of pure blood, tumor cells were found in the same percentage of cases as where it was serosanguinous.

Tumor Cells in Serous Effusions.   Are tumor cells found more frequently in hemorrhagic effusions than in serous ones?   To obtain an answer to this question I collected an additional series of 25 cases of *serous* effusion due to proved metastatic carcinoma of the pleura, with the primary tumor situated either in the lung or in other viscera, the mediastinum excepted. Tumor cells were found in 13 of these 25 cases (52 per cent), an incidence not significantly lower than that found in *hemorrhagic* pleural effusion due to malignant neoplasms (55 per cent), mediastinal tumors again excepted. Although this series is small, it appears justifiable to conclude that the presence of blood in the effusion does not indicate the existence of an ulcerative process causing increased desquamation of tumor cells.

EFFUSIONS NOT DUE TO MALIGNANT NEOPLASMS

Table 1 lists the different diseases which were found to cause hemorrhagic pleural effusions.   They were malignant neoplasms, miscellaneous inflammatory conditions, tuberculosis, pulmonary embolism, uremia associated with cardiac failure, pelvic fibromatous tumors, Hodgkin's lymphogranulomatosis, and lymphatic leukemia.   Table 1 shows, besides, a group of five cases in which it was impossible to determine the nature of the underlying disease.   That they were not due to malignant neoplasms was proved for four of the five by their favorable outcome.

In the non-malignant group, the most frequent cause of hemorrhagic pleural effusion was inflammatory disease of the pleura.   The recognition of such cases is of great prognostic and therapeutic importance.   It is not surprising that an inflammation of the pleura, especially a severe one, should be associated with injury to the capillaries, and therefore, with a hemorrhagic pleural exudate.   At least 21 of the 120 cases of this series were due to inflammation of the pleura.   Eight occurred in association with pulmonary tuberculosis, and 13 in association with miscellaneous inflammatory conditions.   (The five cases in which the underlying disease was not determined, are not included here, but the disease was probably of an inflammatory nature in most of them.)

Tuberculosis.   Tuberculosis is well known to be a common cause of serofibrinous effusion.   Hemorrhagic effusions of tuberculous etiology, however, appear to be much less frequent.   Only eight of the 120 cases of this series were due to tuberculosis.*   This low incidence contrasts with the statement made by Norris and Landis,[4] that tuberculosis is the most common

* Besides these eight, tuberculosis was the underlying disease of one of the cases of spontaneous hemopneumothorax discussed before.   Tuberculosis may also have been the cause of one or two of those hemorrhagic pleural effusions, in which it was impossible to determine the underlying disease.   (Table 1, last group.)

cause of blood-stained effusions. The low incidence of tuberculosis in our series may in part be due to the relatively small number of tuberculous patients who are granted admission to the Mount Sinai Hospital. It is most probable that statistics derived from institutions for the tuberculous show that a large majority of cases of hemorrhagic pleural effusion are tuberculous (because of the very nature of the cases admitted to these institutions). Our statistics are based on the experience obtained in a general hospital, not in an institution for the tuberculous. It is a known fact that pleural effusions are unusual in well developed cases of clinical pulmonary tuberculosis. On the other hand, it is characteristic of tuberculous pleural effusions that they occur in patients who have no symptoms referable to a pulmonary lesion, patients in whom the sputum is negative and a definite diagnosis of tuberculosis is rarely made before they are admitted to a hospital. It may, therefore, be assumed as probable that the experience with pleural effusions at the Mount Sinai Hospital will parallel that which is encountered in ordinary practice.

In six of the eight cases the tuberculous origin was proved; in five by a positive guinea-pig test, and in one by a positive sputum.

In four of the eight cases, the effusion was the first clinical manifestation of tuberculosis. All four were young people. Clinically, these four cases appeared to belong in the group of so-called " idiopathic " pleural effusions. In all cases of idiopathic *serofibrinous* effusion, most of which are believed to be tuberculous, a few erythrocytes are found in the fluid. It is, therefore, not surprising that occasionally enough red blood cells should be present to stain the exudate. The number of white blood cells per cubic millimeter was small, usually below 1000, and they were mostly lymphocytes (95 per cent, 95 per cent and 96 per cent lymphocytes in three of the four cases in which a differential count was made). Norris and Landis [4] consider such a high percentage of lymphocytes as very suggestive of tuberculosis. Our observations in cases of carcinoma do not confirm this statement. An equally high percentage of lymphocytes was found in many cases of neoplasm, especially when the amount of blood admixed with the fluid was small.

A definite tuberculous etiology was proved in two of these four cases. One patient whose fluid gave a negative guinea-pig test, developed an exudative pulmonary tuberculosis with positive sputum the following year. The other showed a positive guinea-pig test after injection of the fluid. This patient has remained well and free from any roentgen-ray signs of pulmonary tuberculosis for five years. The third and fourth were cases of pleuritis with a serosanguinous effusion in which the tuberculous etiology was not proved. In the third case, the Mantoux reaction was positive and the fluid lymphocytic. The patient (19 years) was in the age group in which tuberculous pleuritis is most common, and the course of the disease was marked by fever for three weeks, followed by the slow absorption of the fluid; a thickened pleura remained. Although the case was grouped as one of " idiopathic pleurisy," it may be presumed that it really was tuberculous in nature. The fourth patient was a 17 year old negro with an idio-

pathic pleurisy who entered the hospital with a temperature of 104 degrees. He had fever for a period of eight weeks before the temperature subsided to normal. The Pirquet test was positive. On the first aspiration, two weeks after the onset, the fluid was slightly turbid and contained 2000 leukocytes per cu. mm., of which 95 per cent were lymphocytes. There were only 1000 red cells per cu. mm. On the second aspiration, performed two days later, the fluid appeared definitely serosanguinous. The question remains whether this sanguinous character of the fluid was due to trauma or whether the severity of the pleuritis, evidenced by the prolonged high temperature, was responsible for the formation of a hemorrhagic exudate.

Of the remaining four cases of tuberculous pleural effusion, only one was associated with the ordinary chronic type of pulmonary tuberculosis. This was a case of chronic bilateral apical tuberculosis with a negative sputum, but a positive guinea-pig test after injection of the fluid. Of the three others, two were cases of polyserositis with *bilateral* pleural effusions and pericarditis. One of these two later developed evidence of pulmonary tuberculosis. The other was proved by the guinea-pig test. The following is a brief summary of these two cases:

Case 1. A case of bilateral pleurisy and pericarditis in a young Puerto-Rican. The illness began with fever, cough, and hemoptysis. At first, bilateral pulmonary infiltrations were seen in the roentgen-ray film. Several examinations of the sputum for tubercle bacilli were negative. The guinea-pig test of the fluid was positive. After the pulmonary signs had subsided, the patient developed marked enlargement of the liver, and an increase in venous pressure to 17 centimeters. He recovered after six weeks, and subsequent roentgen films showed the pulmonary infiltrations to have been largely absorbed. Two years later, the patient showed active pulmonary tuberculosis with positive sputum.

Case 2. A case of tuberculous polyserositis proved by a positive guinea-pig test, in a man who also had coronary arteriosclerosis and arterial hypertension. Hemorrhagic fluid was obtained from the pleura on the second of six aspirations.

The eighth case of tuberculous pleural effusion occurred in a patient suffering from Laennec's cirrhosis of the liver with ascites. The diagnosis was proved by postmortem examination. The tuberculous etiology of the large pleural effusion was established by the guinea-pig test. That cirrhosis of the liver in itself may give rise to hemorrhagic pleural effusion has been repeatedly reported in the literature, e.g. by Christian.[9]

I have not observed any hemorrhagic pleural effusions in cases of rapidly advancing pulmonary tuberculosis of the exudative type, nor in cases of acute miliary tuberculosis.

The amount of fluid found in the tuberculous cases—those of polyserositis excepted—was usually smaller than that encountered in the cases of neoplasm, and massive hemorrhagic effusions which covered the lung from apex to base were not seen. The number of leukocytes was below 1000 in five of the six cases in which it was counted, 2000 in the sixth. Lymphocytes greatly predominated in all eight. The specific gravity of the fluid

(cases of polyserositis excepted) was above 1.018, save in one idiopathic effusion, where it was 1.012.

To sum up this group, it may be stated that in my experience, hemorrhagic pleural effusions of tuberculous origin are not very common. They were found to occur in five types:

Unilateral
1. As the first clinical manifestation of tuberculosis, the equivalent of so-called " idiopathic " serofibrinous pleural effusions.
2. As tuberculous hemopneumothorax.
3. In the course of chronic pulmonary tuberculosis (only one case seen).
4. In association with Laennec's cirrhosis of the liver.

Bilateral   As part of tuberculous polyserositis.

Miscellaneous Inflammatory Conditions. This series includes 13 cases of non-tuberculous inflammatory conditions which caused a hemorrhagic pleural effusion. In most of these cases, the effusion was but one manifestation of a violent systemic infection.

A. Sepsis. This infection took the form of a sepsis in the following four cases.

Case 1. A case of hemorrhagic bronchopneumonia and sepsis. Pneumococcus type 3 and *Streptococcus hemolyticus* were grown on blood culture. The infection was so fulminating that the patient died within one day. At postmortem examination, a bilateral pleural effusion was found with 500 c.c. of serosanguinous fluid in each side of the chest.

Case 2. A case of hemorrhagic pleural effusion (1800 c.c.) with fever and sweats of 17 days' duration, then sudden drop of temperature to approximately normal. Sputum was copious; numerous examinations for tubercle bacilli were negative. A few small infiltrations in each infraclavicular region were seen in the roentgen-ray film. The guinea-pig test of the pleural fluid was negative. The fluid contained 50 per cent polymorphonuclears. On blood culture, *Streptococcus hemolyticus* was grown in one flask.

Case 3. Left-sided hemorrhagic pleural effusion in a 2 year old child suffering from acute bacterial endocarditis with *Staphylococcus aureus* sepsis. At necropsy, areas of bronchopneumonia were found in both lungs, also multiple hemorrhages of skin, nose, mouth, and kidney.

Case 4. A 17-day-old infant with acute intestinal intoxication. Here a *Bacillus coli* sepsis was proved by the finding of *Bacillus coli* in cultures from the blood, the lung, and an ear abscess. Confluent bronchopneumonia of the left upper and lower lobes as well as small abscesses of the pleura were found at postmortem examination.

It is well known that sepsis frequently causes damage to blood vessels and thus gives rise to hemorrhage. Two of the four patients just described showed evidences of hemorrhagic tendency by bleeding in various other parts of the body. It is, therefore, not surprising that the pleural effusions of these septic patients should have been hemorrhagic. While all of these four cases also had bronchopneumonia, there seems little doubt that the sepsis and not the pneumonia was the principal cause of the hemorrhagic effusion.

B. Lobar Pneumonia. There were, however, six cases of hemorrhagic pleural effusion in which pneumonia, but no sepsis was found. Only two of the six were cases of lobar pneumonia, one due to type 2, the other to group 4 pneumococcus. In both, the pleural effusion was very small (only 20 c.c. and 75 c.c. respectively were aspirated) and of little clinical significance. Trauma may have caused the hemorrhagic character of the fluid in one or both of these cases as trauma is apt to occur when there is a very small amount of fluid. In any event, hemorrhagic pleural effusion is certainly a rare complication of lobar pneumonia and one of minor importance.

C. Bronchopneumonia. In four cases of this series, bronchopneumonia was associated with hemorrhagic pleural effusion, without sepsis being present. Two of these patients were luetics.

Case 1. A case of bilateral hemorrhagic bronchopneumonia and a very small hemorrhagic pleural effusion on the right side in a patient suffering from secondary lues. The illness began immediately after an injection of neoarsphenamine.

Case 2. A case of grippe pneumonia in a person suffering from secondary lues. Only 20 c.c. could be aspirated.

Lues may play a part in producing hemorrhagic pleuritis. In the first case, however, the clinical picture is more likely to have been the result of a severe reaction to neoarsphenamine. This drug is known to cause injury to capillaries, and the hemorrhagic character of the effusion may be so explained.

The remaining two cases of bronchopneumonia associated with hemorrhagic pleural effusion did not occur in luetics, but had other unusual features.

Case 3. A case of recurrent bilateral bronchopneumonia of unknown etiology, with bilateral pleural effusions. For five months the pleural fluid was clear, then it became serosanguinous; eventually, it was absorbed. Spirillae were found in the patient's sputum. The disease was accompanied by cough and sputum, and was, therefore, probably a form of interstitial pneumonitis with bilateral pleurisy an essential part of the picture; similar in this respect to atypical interstitial pulmonary infections associated with serous pleurisy, the etiology of which is also unknown.

Case 4. A case of suppurative and hemorrhagic bronchopneumonia, post-measles, in a two year old child; blood culture negative. Two hundred c.c. of fluid were aspirated.

Measles (as well as influenza) is known to produce the suppurative and hemorrhagic type of bronchopneumonia. It is not surprising that such a severe inflammation should have been associated with a pleural effusion of hemorrhagic character.

D. Lung Abscess. In a single case of this series, a hemorrhagic pleural effusion was found to complicate a putrid lung abscess. The abscess had perforated, and adjacent to the empyema, a sympathetic serosanguinous effusion was found. It should be noted, however, that anaerobic streptococci were grown on culture from the effusion.

If we omit from consideration the sympathetic effusion adjacent to a perforated lung abscess, we see that in 7 of the 10 cases of miscellaneous

inflammatory conditions so far discussed, small amounts of fluid (20 to 200 c.c.) were encountered; in two, 500 to 900 c.c. were found, and only one had a large effusion. In four cases, the leukocytes in the effusion were counted. In two, 4000 white cells per cu. mm. were found, in the two others, 500 and 1000 respectively. On the whole, the number of leukocytes was higher than in the tuberculous group. More striking were the results of the differential cell count of the leukocytes in the fluid. From 18 to 96 per cent of polymorphonuclears were found in the five cases where such a count was made. The high percentage of polymorphonuclears distinguishes this group from others, e.g. from the tuberculous effusions.

E. *Polyserositis.* In addition to the two cases of polyserositis of tuberculous origin which were discussed before, this series includes two more cases of polyserositis.

Case 1. A case of bilateral hemorrhagic effusion and pericarditis in a patient with active rheumatic fever and chronic rheumatic heart disease. In the absence of congestive failure, the effusions were considered inflammatory, as part of a generalized polyserositis, probably of rheumatic origin. Specific gravity of the fluid was 1.014 on one occasion, 1.015 on another.

Case 2. A case of bilateral hemorrhagic pleural effusion with pericarditis. A faint infiltration in the left lung as seen by roentgen-ray suggested pulmonary inflammatory disease as well. The patient coughed for two years, one year under observation. The effusion was definitely inflammatory (specific gravity 1.020), leaving marked pleural thickening as residuum. This was a case of polyserositis, probably Pick's disease (liver 4 fingers below costal margin) in an early stage, in which the pulmonary inflammation was only part of the process. Cause unknown.

In both these cases, the effusions were bilateral and were of large size (1200 c.c. were aspirated from each case). The white cell count (4400 and 2600 leukocytes respectively) was higher than in the two cases of tuberculous polyserositis, and the number of polymorphonuclear cells found in the differential count (50 per cent and 80 per cent respectively) was much higher.

The occurrence of four cases of polyserositis (the two tuberculous cases included) in a series of 120 cases shows that polyserositis is not a very uncommon cause of hemorrhagic pleural effusion, a fact which may not be generally known.

Uremia with Cardiac Failure. A very large effusion of low specific gravity occurred in a patient suffering from hypertensive heart disease. The patient also had lues. He was in uremia, as evidenced by progressive nitrogen retention. There were associated gastric hemorrhages. In this case, the hemorrhagic character of the fluid could be ascribed to the bleeding tendency caused by the uremic state, in addition to the congestion of the lungs due to heart failure.

Pulmonary Embolization. In 10 cases a hemorrhagic pleural effusion was the result of pulmonary embolization.* This is a type of effusion which

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* In addition to these ten hemorrhagic effusions, eight serous pleural effusions (not transudates) resulting from pulmonary embolization were seen on the wards of the Mount Sinai Hospital during the years 1928 to 1938.

is not uncommon, but less well known and frequently overlooked.[10] The following is a brief summary of these cases:

Case 1. A case of rheumatic heart disease, mitral stenosis, mitral insufficiency, in very mild congestive failure, showed a collection of serosanguinous fluid localized in the fissure between the right middle lobe and right lower lobe. The fact that the effusion was so localized, the high specific gravity of the fluid (1.016), the presence of fever, and the absence of gross signs of congestive failure in the lungs or liver, all made it appear unlikely that the effusion was a transudate. At postmortem examination, a pulmonary infarct was found in the right middle lobe (and left lower lobe). The patient had never had chest-pain or hemoptysis.

Case 2. A case of rheumatic heart disease, mitral stenosis, mitral insufficiency with auricular fibrillation, in congestive failure. Because of the presence of fever and leukocytosis, and because the effusion was loculated, it was assumed that it did not represent a transudate, although the specific gravity was 1.010 on one occasion, 1.016 on another. That the patient had an infarction of the right lower lobe was made probable by a history of acute pain in the right chest and hemoptysis, also by repeated occurrence of embolic phenomena in the brain. Patient died. Permission for postmortem examination was not obtained.

Case 3. A case of rheumatic heart disease, mitral stenosis, aortic insufficiency with evidence of pulmonary embolization (hemoptysis), had a bloody effusion from which *Streptococcus viridans* was cultured. Repeated roentgen examinations showed an area of consolidation in the lung in addition to chronic pleural effusion. The case is one of pulmonary infarction with hemorrhagic effusion. The latter was contaminated with *Streptococcus viridans* probably as a result of infection in the infarct.

Case 4. A case of rheumatic heart disease, mitral stenosis, with bilateral large, frequently recurring bloody effusions of low specific gravity. On one examination a friction rub, possibly pericardial, was heard. Patient died; no postmortem examination was performed. It is impossible to state definitely whether the blood in the effusions was secondary to infarcts or to diapedesis from the congested lung.

Case 5. A case of rheumatic heart disease with frequently repeated hemoptyses and jaundice, developed a bloody effusion of high specific gravity (1.020). On two occasions, areas of consolidation were noted on roentgen examination. Infarcts were found at postmortem examination.

Case 6. A 52-year-old male in congestive failure due to coronary artery disease, entered the hospital with a large hemorrhagic pleural effusion having the characteristics of a transudate (specific gravity 1.010). Two weeks after the aspiration of the fluid, roentgen examination of the chest showed an area of consolidation in the right upper lobe. There was no fever, and no cough or expectoration. Although the patient had no hemoptysis, there was little doubt that the area of consolidation was an infarct.

Case 7. Hypertensive heart disease of unusual nature with recurrent bouts of heart failure for eight years. At post mortem, the heart was diffusely dilated and scarred without any gross narrowing of the coronary vessels. There was a history of hemoptysis three months before the first admission, when an area of consolidation in the lung was noted roentgenologically, in addition to the bloody pleural effusion. Four months later, a bloody effusion was still present. After aspiration, an infiltration in the right lower lobe was again noted. At post mortem, eight years later, no lesion was found in the lung. However, the onset with hemoptysis and the roentgen finding of a persistent area of consolidation within the lung justify the assumption that an infarct had been present.

Case 8. A case of essential hypertension and coronary artery disease with marked left ventricular enlargement. The onset of the illness, with pain in the chest, the

recurrence of chest-pain and hemoptysis after getting out of bed, the presence of fever and leukocytosis, and an increased blood sedimentation rate, all suggested multiple pulmonary emboli as the cause of the bilateral pleural effusion. The finding of an enlargement of the right femoral vein with a large lymph node in Scarpa's triangle pointed to a phlebitis as the possible source of the emboli. That the effusion was not a transudate was indicated by the specific gravity (1.020) and by the absence of other signs of congestive heart failure.

Case 9. The sudden occurrence of fever, chest pain and hemoptysis in a patient who had begun complaining of painful external hemorrhoids five days earlier, strongly suggested pulmonary embolization, with the hemorrhoidal veins as the source. The so-called inflamed hemorrhoid later proved to be a perianal abscess spontaneously discharging pus. The pleural fluid at first contained 75 per cent polymorphonuclears, later 100 per cent lymphocytes. The pleural effusion was of moderate size. There were roentgen-ray signs of an underlying lesion in the right lower lobe. This lesion later cleared up completely.

Case 10. A case of malignant nephrosclerosis, with death in uremic coma. At postmortem, the axillary portion of the left lower lobe showed a cavity within an infarct. The cavity had perforated, resulting in a hemorrhagic pleural effusion. The branch of the pulmonary artery leading to the infarct contained a riding embolus. The source of the embolus was not demonstrated.

Thus, eight of the ten cases of pulmonary embolism were cardiacs; five were cases of valvular heart disease, two were cases of coronary sclerosis in heart failure, and one a case of hypertensive heart disease in heart failure. In such cases, conditions favoring hemorrhagic infarction usually exist. It is, therefore, not surprising that the pleural effusion overlying the infarction should have been hemorrhagic. Only two cases of this group were noncardiacs. In one of these, the source of the embolus presumably was a phlebitis of the hemorrhoidal veins; in the other, the case of malignant nephrosclerosis (number 10), the source of the embolus remained undetermined. The pleural effusions in most of these cases were of large size, often requiring numerous aspirations. The fluid was always serosanguinous, never " pure blood." The white cell count in the fluid, which was made in nine of the ten cases, was below 1000 in eight instances, and the white cells were almost all lymphocytes, except in the patient suffering from pararectal abscess, where 75 per cent polymorphonuclears were found.

Pelvic Fibromatous Tumors. A small group of cases, but one to which unusual interest is attached, consists of two cases * of hemorrhagic pleural effusion secondary to pelvic fibromatous tumors. This syndrome, until recently unknown, has been established as a clinical entity by the reports of Hoon, Salmon, Meigs and Cass, and Weld.[11] Of the cases included in this series, one had a fibroma of the right ovary, the other fibromyomata of the uterus. Both had ascites and large right-sided bloody pleural effusions, which disappeared following operative removal of the pelvic tumors. In both cases, the fluid failed to show tumor cells on repeated examination. In the one patient where a cell count was made and the specific gravity tested, the

* The two cases included in this series are the same which Salmon [11] has reported in detail. Salmon's third case as well as the other 14 cases reported in the literature had serous pleural effusions.

fluid contained 920 white blood cells per cu. mm., 92 per cent of which were lymphocytes; the specific gravity was 1.020. Both patients are now well. The manner in which the pelvic tumors led to the development of the pleural effusions is obscure. Rabin [12] has suggested that this type of pleural effusion might also be caused by pulmonary embolization.

Leukemia and Hodgkin's Lymphogranulomatosis. Two cases of chronic lymphatic leukemia and one case of lymphogranulomatosis were included in this series. The following is a brief description of these three cases.

Case 1. A case of chronic lymphatic leukemia in a 63-year-old woman who showed petechiae in the mouth, pharynx, skin, and retina. The platelet count was only 30,000. The effusion was bilateral. On the right side, it was very large and reaccumulated rapidly. The fluid contained 54,000 white blood cells, nearly all small lymphocytes. The patient died; permission for postmortem examination was not obtained.

Case 2. Bilateral serosanguinous pleural effusion in a case of chronic lymphatic leukemia with large mediastinal growths. On the right side, the effusion was of very large size and reaccumulated rapidly after aspirations. The fluid contained 65,000 white blood cells, 99 per cent of which were lymphocytes. The patient later developed cutaneous, conjunctival, and gastric hemorrhages, and his platelet count which had been normal, dropped to 60,000. The patient died; permission for postmortem examination was not obtained.

Case 3. A case of lymphogranulomatosis, proved by biopsy of a cervical gland. The patient had a very large effusion on the right side, and the roentgen-ray film also showed a small effusion on the left side. Four thoracocenteses were performed within nine days. The first three aspirations yielded serosanguinous fluid, the fourth yellow, turbid fluid. The fluid contained only 500 white blood cells per cu. mm., 56 per cent of which were polymorphonuclears and 44 per cent lymphocytes. The patient showed no other signs of bleeding tendency. The patient died; permission for postmortem examination was not obtained.

Hemorrhagic tendencies are characteristic of lymphatic leukemias, and it is therefore easily understood that pleural effusions developing during their course should have been hemorrhagic. In both cases of leukemia, there were hemorrhages of other organs, and both had a low platelet count. A characteristic feature of both cases was the finding of very large numbers of lymphocytes in the pleural fluid. I have not found any other type of effusion with a similarly high number of lymphocytes.

Lymphogranulomatosis, on the other hand, is not characterized by bleeding tendencies. At the Mount Sinai Hospital, a considerable number of cases of this disease has been observed, but the case reported here is the only one associated with a hemorrhagic pleural effusion.

In all three cases, the effusions were bilateral and were as massive as those due to malignant neoplasm commonly are. They also reaccumulated rapidly after each thoracocentesis.

Diagnosis Undetermined. There were five cases in which the nature of the pleural effusion remained undetermined.

Case 1. A 43-year-old man with a hemorrhagic effusion of short duration. The effusion disappeared within three weeks after aspiration. Unusual features of the case

were a hemoptysis, and the fact that the fluid contained 30 per cent eosinophiles. Guinea-pig inoculations were negative for tuberculosis. Roentgen-ray examination after the disappearance of the effusion showed no evidence of a tuberculous lesion in the lungs. The hemoptysis and the pleural effusion should, therefore, be explained on some basis other than tuberculosis.

Case 2. A hemorrhagic pleural effusion showing 89 per cent lymphocytes in a boy of 16, associated with fever, congested pharynx, cough with purulent sputum, and a submaxillary abscess. Pleural fluid was negative for tubercle bacilli on guinea-pig inoculation and Loewenstein culture. Two guinea-pigs inoculated with pus from the submaxillary abscess died within 12 and 14 days, respectively, without evidence of tuberculosis. In the absence of proof, the case cannot be considered tuberculous; the symptoms suggest an infection beginning in the throat and descending into the pleura.

Case 3. A 44-year-old man entered the hospital with signs of polyneuritis of the extremities, leukocytosis of 41,200, and a serosanguinous effusion in the left pleural cavity. The effusion, which was lymphocytic, did not reaccumulate after two aspirations. Roentgen-ray showed a coarse shadow in the left lower lobe. Subsequent films showed gradual disappearance of this shadow. The patient lived for two and a half more years, during which the signs of polyneuritis gradually improved and pulmonary symptoms remained absent. He had essential hypertension and died of acute coronary thrombosis at another institution. While it is impossible to determine the cause of the pleural effusion, it can be definitely stated that it was not neoplastic.

Case 4. A mildly hemorrhagic effusion (4700 red blood cells per cu. mm.) persisting over a period of four months, associated with low grade fever (up to 101, rarely to 102 degrees), anemia (hemoglobin 40 to 60 per cent), and arthritis. The joints contained grumous material. The effusion was evidently part of a generalized inflammatory disease, the nature of which is unknown. Although the Mantoux test was positive in a dilution of 1 : 100,000 and although there developed a symmetrical fusiform swelling in two toes, two guinea-pig inoculations with the pleural fluid and one with the joint-fluid were negative for tubercle bacilli.

Case 5. A case of luetic aortic insufficiency in congestive heart failure. The fact that the hemorrhagic pleural effusion was encapsulated in the right lung fissure suggested that it might not be a transudate. The specific gravity of the fluid was not determined. In the absence of chest-pain, hemoptysis, fever, and leukocytosis, there is no evidence that the patient had an infarct of the right lower lobe. The patient died. Postmortem examination was not made.

While the cause of the pleural effusion in these five cases remained obscure, one may be reasonably certain that they were not due to neoplasm. It seems fair to assume that the effusion in most, if not in all of them, was inflammatory in origin.

Conditions Not Occurring in This Series. A number of other conditions which are described in the literature as causes of hemorrhagic pleural effusion did not occur in this series. They are typhoid fever (Gasparini[13] Piana[3]), paratyphoid B infection (Bollettini[14]), malaria (Zimine[15]), rheumatic fever, anthrax, bubonic plague, scurvy, purpura, hemophilia (Lauche[16]) icterus, severe anemia (Kaufmann[17]), small-pox (Beitzke[18]), and nephritis (Lord[5]).

SUMMARY

1. One hundred and twenty cases of hemorrhagic pleural effusion, exclusive of six cases of spontaneous hemopneumothorax, were analyzed.

2. Seventy-eight cases (65 per cent) were due to malignant neoplasm.

a. In 77 of these, the neoplasm was metastatic.

b. In half of these cases, the primary neoplasm was in the lung, and in the remainder it was in other organs.

c. In only one case was the tumor primary in the pleura.

d. Tumor cells were found in 50 per cent of the hemorrhagic effusions examined, which was the same frequency as that observed in non-hemorrhagic neoplastic effusions.

3. Forty-two cases (35 per cent) were due to various other causes, viz.

a. miscellaneous inflammatory conditions (13 cases)

> α sepsis
> β lobar pneumonia
> γ bronchopneumonia
> δ lung abscess
> ε polyserositis

b. tuberculosis (8 cases)
c. pulmonary embolization (10 cases)
d. pelvic fibromatous tumors (2 cases)
e. leukemia (2 cases)
f. Hodgkin's lymphogranulomatosis (1 case)
g. uremia associated with cardiac failure (1 case)
h. undetermined causes (malignant neoplasm excluded) (5 cases).

4. Tuberculous hemorrhagic pleural effusions were infrequent (8 cases). Four of these appeared as " idiopathic " pleural effusions, two as part of a tuberculous polyserositis, one in association with cirrhosis of the liver, and only one was associated with chronic pulmonary tuberculosis.

5. The frequency of the various types of polyserositis as a cause of hemorrhagic pleural effusion (four cases) is noteworthy.

6. A hemorrhagic effusion may be the sole evidence of a hidden pulmonary embolus.

7. The determination of the percentage of polymorphonuclears and lymphocytes in the fluid does not aid in differentiating between malignant and inflammatory conditions of the pleura. The two cases of hemorrhagic effusion due to lymphatic leukemia were characterized by lymphocytic counts much in excess of all other cases in the series.

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ANTACIDS: THEIR EFFECT BY TITRATION AND WITHIN THE HUMAN STOMACH *

By HERBERT C. BREUHAUS, M.D., and JAMES B. EYERLY, M.D.,
Chicago, Illinois

OF the various forms of treatment used in peptic ulcer, acid neutralization therapy has held the most prominent position for over one hundred years. In the quest for a better antacid many substances have been tried but no ideal agent has been found. Many virtues have been attributed to these compounds but as far as is known their chief value lies in their acid reducing property. We have, therefore, made analyses of some of the more commonly used substances on a basis in which their neutralizing capacity by titration can be compared with their antacid property within the human stomach.

It has been repeatedly shown that the amounts of acid and other gastric secretions vary, not only in different individuals but also from time to time in each subject. Careful work by Hollander [1] seems to corroborate Pavlov's theory that the concentration of acid secreted is constant but the amount produced varies. Although no pure parietal secretion has been obtained, it has been calculated that a concentration of 0.17 N HCl, isotonic with blood, is formed. [2] No gastric concentration greater than this has been found and it is plausible that all lesser concentrations are due to dilution or buffer substances. Most antacids are evaluated in terms of 0.10 N or 0.05 N HCl. If a physiologic basic is desired, we believe it should be made in terms of pure parietal secretion.

Neutrality should be defined unless a truly neutral solution is meant. Only at pH 7, when both hydrogen and hydroxyl ions are in equilibrium, do we have a neutral solution. Frequently neutrality is implied when a solution is neutral to a given indicator, such as Toepfer's reagent which has a range from pH 2.9 to 4. If other dye indicators are used their pH range should be kept in mind.

As far as gastric acid reduction is concerned, pH 7 is unnecessary since practically no pepsin activity is seen above pH 5. The free acidity end point is pH 3.5 and that of total acidity pH 7. Hollander [3] has designated pH 5 as the proteolytic neutralization point. Pepsin activity follows a bell-shaped curve as the hydrogen-ion concentration is increased; optimum action on most proteins occurs between pH 1.5 and 2.5 and decreases after that point is reached.

In a previous study we were unable to measure any egg white digestion in the stomach when its contents were maintained at pH 3.5 or higher, over

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a three hour test period.   From our experience it seems unlikely that pH 5, desirable as it may be, is frequently attained or maintained in antacid therapy and therefore we believe that pH 3.5 within the stomach should be considered sufficient at the present time.

METHOD OF PROCEDURE

Toepfer's reagent (dimethyl-amino-azobenzene) is the most commonly used dye indicator in titrating gastric contents.   This dye is bright red at pH 2.9 and yellow at pH 4.0.   In clear solutions accurate titrations can be made but colored or opaque media make it difficult to estimate a uniform end point.   Recent improvements in electrometric measurement of pH with a glass electrode make it possible to determine acid values easily and accurately.   For these reasons we made all measurements with a Coleman electrometer, using a glass electrode.

In the titrations, two grams of dry or 10 c.c. of liquid were used as standard amounts of test substance.   These were dissolved or diluted in 150 c.c. of distilled water, a reading taken and 0.17 N HCl added in 2 c.c. amounts.   The titration flask was stirred continuously and a reading taken after each addition of acid.   Most substances gave an immediate constant reading.   Slowly acting antacids were tested by adding 30 c.c. of acid at one time and taking readings at five minute intervals for 30 minutes.

In testing the reaction within the human stomach a special [4, 5] glass electrode was placed in the antrum.   Patients without organic gastrointestinal pathology were chosen.   Ninety cubic centimeters of milk and antacid were given individually at alternate half-hour intervals.   No other medication was given.   The electrode was lowered into a fasting stomach, ulcer management begun and in 30 or more minutes test readings were started.   In each instance readings were taken at five minute intervals over a two hour period.

RESULTS

BY TITRATION

Magnesium Salts.   In table 1 the tremendous neutralizing capacity of magnesium is apparent.   The oxide is more than twice as effective as calcium carbonate, its closest rival, but its use is limited because of its laxative

TABLE I

The comparative neutralizing capacity of equal amounts of commonly used antacid powders as determined by titration

*Comparative Neutralizing Values * of Inorganic Antacids*

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10 gr. (.66 gm.) Magnesium Oxide.................... 81.8 c.c.
10 gr. (.66 gm.) Calcium Carbonate.................. 37.4 c.c.
10 gr. (.66 gm.) Sodium Bicarbonate................. 23.3 c.c.
10 gr. (.66 gm.) Tribasic Calcium Phosphate......... 20.6 c.c.
10 gr. (.66 gm.) Tribasic Magnesium Phosphate....... 16.6 c.c.
10 gr. (.66 gm.) Magnesium Trisilicate (Trisomin)..... 30.0 c.c. (30 min.)
10 gr. (.66 gm.) Bismuth Subcarbonate............... almost 0.
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* Amount of .17N HCl required to titrate equal weight of antacids to pH 3.5.

property. It is employed chiefly in combination with sodium bicarbonate (table 2) as a laxative in ulcer management. An attempt has been made to take advantage of this antacid property in magnesium trisilicate. This substance acts both chemically and physically by adsorption. The adsorptive action is very slow and its chief reaction is chemical to form magnesium chloride ($MgCl_2$). Normally the trisilicate is very stable and quite inert unless specially prepared. If used in tablet or capsule form its opportunities

TABLE II

The comparative neutralizing capacity of the usual amounts of antacids
used in ulcer therapy

Neutralizing Capacity of Usual Amounts of Antacids *

10 gr. (.66 gm.) Sodium Bicarbonate 〕	
10 gr. (.66 gm.) Magnesium Oxide �'...............	105.3 c.c.
20 gr. (1.3 gm.) Tribasic Calcium Phosphate 〕	
15 gr. (1.0 gm.) Tribasic Magnesium Phosphate �'......	66.2 c.c.
15 gr. (1.0 gm.) Calcium Carbonate..................	56.1 c.c.
3 oz. (90 c.c.) Whole Regular Milk...................	39.7 c.c.
3 oz. (90 c.c.) Half Milk and Half Cream (22%).......	37.0 c.c.
10 gm. Mucin..	54.4 c.c.
10 c.c. Aluminum Hydroxide (Amphojel).............	30.0 c.c. (in 7 to 10 min.)
10 gr. (.66 gm.) Magnesium Trisilicate (Trisomin)......	30.0 c.c. (in 30 min.)

* Amount of .17N HCl required to titrate the antacid to pH 3.5.

for reaction are delayed further. To bring out its optimum action only the powder form was used. Even in that state its action was slow and thirty minutes passed before 30 c.c. of 0.17 N HCl were brought to pH 3.5 by 10 grains of this antacid.

Calcium Carbonate. This powder is one of the oldest and best known antacids. It is very effective in speedy acid reduction and economical (chart 1). Slight solubility has discouraged its use because of a tendency to upset the body chemistry, especially in patients with disturbed renal function. If given frequently, its constipating action must be regulated with a laxative.

Tribasic Powders. We use the tribasic forms of calcium and magnesium phosphate extensively. Their limited neutralizing capacity is made up by giving larger doses. Usually a combination of 20 grains of calcium and 15 grains of magnesium is used. Such a combination not only produces satisfactory acid reduction (table 1) but in most instances allows normal bowel action. The relationship of calcium and magnesium can easily be adjusted to suit the required acid reduction and bowel function when necessary. The extreme insolubility of these salts reduces the likelihood of alkalosis, and very few patients show any idiosyncrasy to them.

Sodium Bicarbonate. Cheapness and availability have made this salt one of our best known antacids. It is satisfactory for occasional use but must not be taken at frequent intervals because of its capacity to disturb the acid-base balance of the body (chart 1).

Bismuth Subcarbonate. This substance is a frequent ingredient of antacid powders. It is merely included to show that it has practically no neu-

tralizing capacity (table 1). Formerly it was thought to have a special affinity for an ulcerated surface and to produce a protective coating, but many observations have disproved this.

Aluminum Hydroxide. This substance has attained wide popularity by virtue of ease of administration and its non-constipating action. It is said not to disturb the acid-base balance of the body but in certain individuals nausea and upper abdominal discomfort are noted. It acts by chemical decomposition to form aluminum chloride, by adsorption, and it is quite astringent. Unless specially treated it is almost inert. Acid reduction is comparatively slow and six to ten minutes are required for 10 c.c. of the usual liquid preparation to bring 30 c.c. of 0.17 N HCl to pH 3.5 (table 2).

Milk. The ability of milk to reduce the corrosive action of gastric juice has kept it prominent in the treatment of gastric disturbances for over one hundred years. It not only neutralizes acid but also provides an excellent source of nutrition; its salts and proteins are the chief acid reducing substances.

TABLE III

Comparative acid reduction of various forms of milk and milk products when titrated against .17 N HCl

Neutralizing Capacity * of Various Forms of Milk*

I. Liquid Form—(90.0 c.c.)
    Sofkurd.. 41.7 c.c.
    Skim-milk...................................... 41.7 c.c.
    Regular Whole Milk........................... 39.7 c.c.
    Half Milk and half Cream..................... 38.2 c.c.
    Cream (22%).................................. 34.2 c.c.
II. Powder Form (9.0 gm.)
    Fat-free Sofkurd.............................. 45.0 c.c.
    Skim-milk...................................... 42.3 c.c.
    Powdered Whole Milk (Klim)................. 32.3 c.c.
    Sofkurd (Regular)............................ 31.5 c.c.

* Amount of .17N HCl required to titrate equal amounts of milk to pH 3.5.

Comparative neutralization values of different forms of milk are shown in table 3. One gram of this powder usually equals 10 c.c. of the corresponding liquid form. Liquid Sofkurd, skim-milk and fat-free Sofkurd powder produce the greatest acid reduction. Regular whole milk and a combination of half milk and half cream (22 per cent) are very satisfactory and are commonly used. Increased fat content, as is shown for 22 per cent cream, necessarily reduces neutralizing capacity.

Because fat slows gastric peristalsis and does not aid in acid reduction we are using milk alone rather than a half milk and half cream mixture.

Table 2 is merely included for convenience to show the neutralizing capacity of the usual amounts of antacid used in ulcer therapy.

Gastric Content Neutralization. Characteristic gastric pH values are shown in table 4. These figures represent the average readings obtained at five minute intervals over a two hour test period for patients N. L. B. and A. H. Usual doses of antacid rather than equal amounts of neutralizing

substance were given.   By this means an impression is obtained as to the relative effectiveness of each substance within the stomach when given in ordinarily prescribed amounts.

Since the motility, emptying time and amount of acid secreted cannot be known during each test period, we can only compare the results of different antacids with each other and with the fasting state.   The neutralizing capacity of the substances used was not equal, yet their proportional acid reduction was not the same.

TABLE IV

Gastric content pH as found when different antacids were used.   The total neutralizing capacity of the antacids used in each test is shown

Gastric pH Values

Test	Patient		Antacid's* capacity
	N. L. B.	A. H.	
Fasting State..	1.60	1.44	0
Tribasic Calcium Phosphate..............20 gr. (1.3 gm.) Tribasic Magnesium Phosphate...........15 gr. (1.0 gm.)	2.04	4.02	191.8 c.c.
Calcium Carbonate......................15 gr. (1.0 gm.)	1.70	3.28	191.6 c.c.
Sodium Bicarbonate....................20 gr. (1.3 gm.)	2.27	1.92	172.6 c.c.
Aluminum Hydroxide (Amphojel).................10 c.c.	1.81	1.88	139.0 c.c.
Mucin (Armour & Co.).........................10 gm.	1.33	1.88	188.2 c.c.
Magnesium Trisilicate (Trisomin)........10 gr. (0.65 gm.)	1.45	2.37	139.4 c.c.
Milk....................................3 oz. (90 c.c.)	2.40	2.90	158.8 c.c.

Average pH values of gastric contents of patients N. L. B. and A. H. obtained when readings were taken every 5 minutes over two hour test periods.   Except in the fasting state, the test substance was given every hour and 3 oz. (90 c.c.) of milk on the half hour.

* Amount of .17 N HCl required to titrate amount of antacid used during test period, to pH 3.5.

The tribasic powders, calcium carbonate and mucin are equal in neutralizing capacity, yet the first two produced the greatest pH elevation in both patients.   These two antacids act quickly, are rapidly diffused and consequently are able to exert their intended effect before leaving the stomach. Mucin, on the other hand, is quite viscid, not readily diffused, and did not produce the desired effect.   When titrated in a flask its maximum acid reduction is permitted by vigorous stirring and dilution; gastric peristalses produce less mixture and much of this substance does not come in contact with the gastric secretion.

In the sodium bicarbonate test almost as much neutralizing substance is used as in each of the first three discussed.   It is readily diffused, reacts rapidly and yet the average obtained is relatively low; in N. L. B. the highest value was pH 5.48 ten minutes after taking the powder, but in A. H. pH 2.28 was the highest reading obtained at any time during the test.

The neutralizing effect of aluminum hydroxide and magnesium trisilicate has been improved; they react less slowly than formerly, 10 c.c. of the former bringing 30 c.c. of 0.17 N HCl to pH 3.5 in seven to ten minutes, and the latter requiring 30 minutes to accomplish the same result with 10 grains.   If an adequate amount of either substance is given and it is retained within the stomach for a sufficient period of time, satisfactory pH elevation should occur.   In both instances shown these substances did not produce satisfactory acid reduction.

When 90 c.c. of milk were given every half hour a higher average value was obtained in N. L. B. than when this substance was alternated with another antacid.   In patient A. H., the tribasic powder and calcium carbonate tests were the only ones which gave a higher value than when milk alone was used.   These results speak very favorably for milk and should be considered in other tests in which it represents 50 per cent of the neutralizing substance.

Summary

A better understanding as to the effectiveness of antacids is needed.   This can be accomplished by comparing titration values with those obtained within the stomach.   Such neutralization can best be studied by use of a gastric electrode placed in the most acid portion of the gastric content and the amount of acid reduction frequently determined.   By this means continuous values may be obtained and the gastric content is not disturbed. If the stomach functioned as a churn and the acid content were the same in all portions, aspiration samples could be used; but since there is a marked difference in degree of acidity in different regions, such samples are not satisfactory.   Furthermore, aspiration changes volume, and arrangement of the stomach content and frequent removal of material alter the usual state of affairs.

An antacid to reduce the gastric acidity must be readily diffused, act promptly, and be given frequently in adequate doses.   Viscid substances, tablets or capsules, prevent rapid diffusion and thus even a potent antacid may leave the stomach before being able to exert its intended effect.   The same holds true for slowly acting substances; unless there is gastric retention an antacid must act within thirty minutes or less to be effective.

Pure gastric juice has no constant acidity.   Since this secretion is a mixture we have chosen the calculated value for the pure parietal secretion, 0.17 N HCl, which apparently is fixed, rather than some arbitrary value.

The end point pH 3.5 may later be shown to be incorrect.   From our experience in egg white digestion studies and from observations on the acid level usually attained or maintained in antacid therapy, it does not seem likely that a higher value is necessary.

Conclusions

1. A standard means of antacid evaluation is suggested.

2. The physical as well as chemical properties of antacids should be considered in neutralization therapy.

3. The degree of gastric acid reduction accomplished with an antacid cannot always be predicted from its potential neutralizing capacity as determined by titration.

4. In most instances a surprisingly small decrease in gastric acidity is accomplished even when the customary amount of antacid is given every 30 minutes.

5. Milk is one of our most satisfactory neutralizing agents.

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A NEW TYPE OF GRADUATE COURSE IN INTERNAL MEDICINE *

By N. L. CRONE, M.D., and J. H. MEANS, M.D., F.A.C.P.,
Boston, Massachusetts

THE development in recent years of a steadily mounting demand for graduate training in the specialties, including that of internal medicine, of a sustained and practical sort, quite different from that provided by the usual "refresher" course, has occasioned a search for new types of curriculum. Hospital residencies, to be sure, may provide such training, but with the pressure generated by the various specialty boards the opportunities which residencies provide are inadequate.

To meet the demand in a new way, in the field of internal medicine, the course which we are about to describe was put into operation in the Medical Clinic of the Massachusetts General Hospital in September 1939. The objective was twofold: first, to provide a year of training which would be acceptable as one of the years prescribed by the Board of Internal Medicine; and, second, to increase the man-power of the hospital staff by making use of the professional service of the graduate students.

It is, we believe, the common experience of medical educators that work done by students which carries genuine responsibility in the care of the patient is more stimulating, satisfactory, and indeed educational, than that which is organized without any such responsibility. Internships and residencies are the outstanding type of training by the method of taking responsibility under guidance. The clinical clerkship of undergraduate medical students is another example. In designing the course under discussion the element of responsibility was included insofar as this was possible without disrupting the house staff and undergraduate curriculum. The Out-Patient Department, which is large, provided an opportunity.

The undergraduate student of medicine pays a substantial fee for his instruction. The medical graduate, receiving further training as intern or resident, pays for his instruction by service. Indeed, for the payment which he makes in service he receives not only experience, but also board and lodging and, in the case of residents, a small salary. The graduate course which we have devised occupies a position between these extremes. The graduate student pays for his instruction partly in money, partly in service. The tuition fee has been reduced to a minimum and professional service accepted, so to speak, in part payment for instruction.†

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† The money received in fees is used to pay salaries to those instructors devoting a considerable amount of time to the course, chiefly the tutor in general charge. The payment in service may be looked upon as payment to the clinic for overhead and for a considerable amount of instruction given by many of its staff, without remuneration, as part of their regular routine. That is to say, the graduate student helps the clinic, and in turn the clinic helps the graduate student.

Course No. 240, as it is listed by the Harvard Medical School Courses for Graduates, was preceded by a system under which graduate students had been coming to the hospital individually for a number of years, with a full-time curriculum arranged for each to meet individual needs.   The curriculum of Course No. 240 has been modeled in the light of experience gained in the cases of these individuals who came to us before the course was formally organized.

Course No. 240 is of 12 months' duration.   It is limited to six doctors. Those selected are carefully chosen.   Except for unusual reasons no physician over 35 years of age is accepted.   On the other hand, preference is given to candidates who have had at least one year's intern service and have had some experience in the practice of medicine.   The candidate should also belong to his local medical society.   In addition to these general requirements, letters of recommendation from older physicians are required and in many instances a personal interview is arranged.   This gives an opportunity for careful selection while, at the same time, the nature of the course can be explained to the applicant so that he may be sure he is getting just what he wants in the way of training.

Each student spends two mornings a week in the General Medical Clinics of the Out-Patient Department.   Here he takes, each morning, two new cases and five to six " old " ones, i.e., patients whom he saw as new ones and has followed since.   In this way a moderate-sized practice is conducted over a period of a year.   The student has ample time to do complete work-ups and careful follow-ups on all his patients.   One of the regular members of the staff is in attendance each day to supervise the work of the graduate students, and since he has only two students each day for whom he is responsible, he has adequate time to go over their cases and discuss diagnosis and treatment with them quite thoroughly.   The graduate student's work is done competently, and he is able to see a great many patients in the course of a year under adequate supervision.

In addition to work in the general Out-Patient Department Medical Clinics, as described above, the student is rotated through the various special medical clinics, such as those for diabetes, syphilis, ovarian dysfunction, gastrointestinal, pulmonary and cardiac diseases, etc.   The student is given as much free choice as possible as to the clinics in which he will work. It is felt, however, that it is more important to spend a considerable amount of time in certain clinics than a small amount in all.   For that reason, a minimum of three months is required in each clinic, one or two days per week.   In these clinics the same method pertains.   The student works as a regular member of the staff under the supervision of one more experienced.

Each student is assigned to one of the two house medical services on the mornings when he is not in the Out-Patient Department.   Here he attends ward rounds with the visiting physician, house staff and undergraduate students.   He is given opportunity to observe, to take part in the discussions, to ask questions, and to offer suggestions.

In the normal life of the hospital there are a number of instructive meetings which occur regularly as part of the hospital program. Such exercises are the Medical Grand Rounds, the Clinico-Pathological Conference, the various staff meetings, Research Conference, etc. The student not only has access to all of these, but is urged to attend. This constitutes a valuable part of the training.

The subject of pathology is regarded as one of great importance and to it considerable time is devoted. For a period of three months, one of the members of the pathology staff conducts a concentrated course in pathology three afternoons a week. Not only is gross and microscopic pathology considered, but the clinical histories and physical findings are correlated with the gross and microscopic findings. The instructor also conducts clinico-pathologic exercises each afternoon of the course. In rotation each student is given a clinical history a few days before he is to present it. At the exercise he presents his case and discusses the differential diagnosis. The whole group enters into the discussion, at the conclusion of which the pathologist presents the autopsy findings, and in the light of these, the case is further discussed. At about a third of these exercises the clinical side of the case is presented and discussed by one of the members of the medical staff. In these three months a good comprehensive review of pathology is conducted, with special emphasis on its relation to the practice of internal medicine.

Instruction in certain more specialized subjects is carried on by members of the staff particularly interested in these fields. Thus a course in hematology is given during the afternoons of one month. Not only are lectures given, but the students are required to study the patients and to perform the necessary blood studies on them. A six weeks' course in cardiology, with work in roentgen-ray and electrocardiography, is conducted by one of the members of the cardiac department. Similar work is available in neurology and in arthritis. Other special work may be added as time goes on.

From time to time throughout the year, rounds or talks on special clinical or laboratory subjects are given by various members of the staff working in such special fields.

One of the younger members of the staff is in direct charge of the group, under the supervision of the Chief of the Medical Services. This younger member acts as tutor. He arranges the schedules of the individual student and meets with the group to discuss their work at weekly conferences. A journal club is also organized. Each member of the group is made responsible for certain journals, which he reads and from which each week he presents and discusses articles of significance. This stimulates the students to become familiar with the more recent literature. Topics of special interest are also assigned to each student. The topic is looked up in detail in the standard works and in the recent literature, and presented to the whole group at one of the weekly conferences.

In addition to all these activities, which are more or less organized, the student is encouraged to do considerable reading in the libraries, both at the hospital and outside. He also has access to the wards for study of patients at any time.

From the above description it can be seen that the course is so arranged that the student is able to see a great deal of clinical material in the course of a year and has the time to digest this thoroughly. This clinical experience is supplemented by formal instruction in certain fields which lend themselves to this method, and by reading. In this way we believe a well rounded experience and course of study are presented.

Summary

A new type of graduate course is described. It is designed to give full-time graduate training of a practical nature, in internal medicine, to young physicians who have had internships and who, preferably, have been a few years in general practice. This course serves as a preparation for the practice of internal medicine as a specialty. The principle is introduced of holding the tuition fee at a minimum and of letting the student make part of his payment for instruction in the form of professional service rendered. A method has been found by which graduate students of this sort can be accommodated in a large teaching clinic without interfering in any way with the work of either the house staff or the undergraduate medical students.

CASE REPORTS

INFLUENCE OF VARIOUS THERAPEUTIC MEASURES ON PERIODIC HEART BLOCK ASSOCIATED WITH CHEYNE-STOKES RESPIRATION; A CASE REPORT *

By HENRY MILLER, M.D., and FRANK T. FULTON, M.D., *Boston, Massachusetts*

THE number of published reports of cyclic disturbances in cardiac rhythm associated with the two phases of Cheyne-Stokes respiration are few. Steele and Anthony [1] in 1933 were able to find but 15 cases including their own and of these only seven were studied by means of electrocardiograms. Since then several additional cases have been recorded in the literature.[2] It is not the purpose of this communication to review to any extent the literature pertaining to the arrhythmias associated with Cheyne-Stokes respiration but to report the study of an interesting case coming under our personal observation. The effect of various therapeutic measures with specific effects on the circulatory and respiratory systems was ascertained in an effort to obtain a better understanding of the mechanism involved.

CASE REPORT

I. W., a 56-year-old Negro, was admitted to the Rhode Island Hospital on October 9, 1938 complaining of exertional and paroxysmal dyspnea, cough and insomnia. There was a definite history of an untreated penile sore about 20 years previously.

A diagnosis of luetic aortitis was made. The patient improved rapidly on bed rest, digitalis and routine cardiac care and was discharged improved 11 days later. An electrocardiogram (figure 1*A*) showed marked left axis deviation, prolonged P–R time up to 0.24 second and diphasic T-waves in Lead I.

On November 13, 1938 he was readmitted to the hospital in an attack of acute pulmonary edema. He again improved rapidly on oxygen, bed rest, digitalis and sedatives and was discharged two weeks later. An electrocardiogram (figure 1*B*) showed a more deeply inverted T_1, a diphasic T_2 and marked left axis deviation. In the precordial lead the T-wave was now inverted.

Following discharge, the patient was fairly comfortable on markedly restricted activity and 1½ grains of digitalis per day until 12 days prior to admission to the hospital at which time he again began to experience attacks of nocturnal dyspnea. Because of the increasing severity of these attacks he was again admitted to the hospital.

Physical examination revealed a well-developed and nourished Negro exhibiting Cheyne-Stokes respiration. The periods of apnea lasted from 20 to 30 seconds and hyperpnea from 45 to 55 seconds. It was noted that the pulse became slow during the apneic periods and increased during the hyperpneic phases. The veins of the neck were congested and showed expansile systolic pulsations. Marked systolic pulsation of the carotid vessels was present. The pupils were unequal and fixed to light; the fundal vessels were moderately arteriosclerotic. A heaving elevation of the entire chest synchronous with each heart beat was evident. Resonance was diminished over the

A   B   C
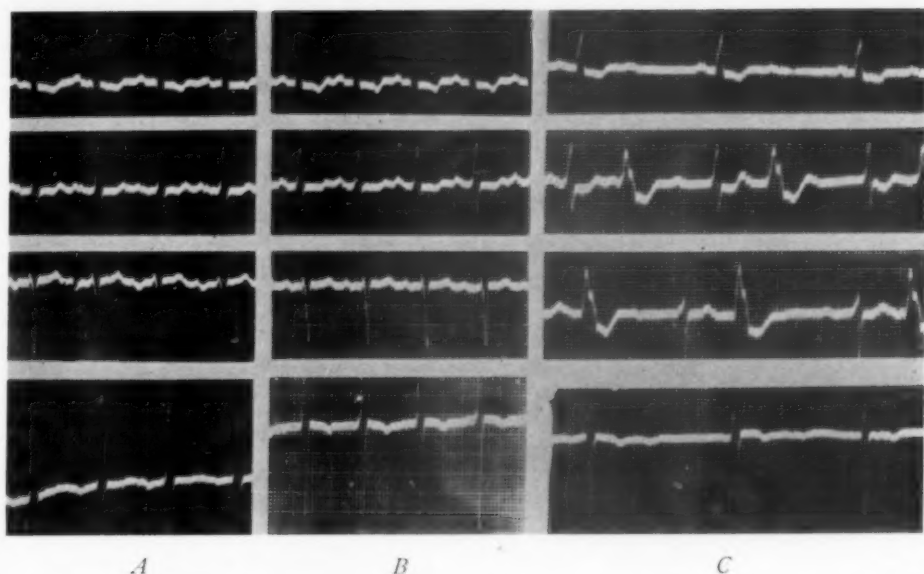
FIG. 1 A (Oct. 1938). P–R interval 0.24 sec. Rate 88 per min. B (Nov. 1938). P–R interval 0.20–0.22 sec. Rate 94 per min. C (May 1939). Leads I and IV—(2:1) partial heart block; Leads II and III complete A–V dissociation with bigeminy due to ventricular extrasystoles.

lower third of both lungs posteriorly and over these areas, moist râles were heard. The outermost point of cardiac action was seen and felt in the sixth left intercostal space in the mid-axillary line as a systolic heave of marked amplitude. The right cardiac border was percussed five centimeters from the midsternal line in the fifth interspace. There was a moderately loud systolic and blowing diastolic murmur best heard at the base but transmitted over the entire precordium. The pulmonic second sound was accentuated. During apnea, the rate was approximately 40 per minute and during hyperpnea, 78 per minute. The peripheral vessels were moderately thickened and Corrigan pulse, capillary pulsations and Duroziez's sign were present. The blood pressure was 154 mm. Hg systolic and 60 mm. diastolic during both apnea and hyperpnea in both arms. A firm liver edge was palpable two fingers'-breadth below the right costal margin. There was pitting edema over the ankles and the knee jerks and ankle jerks were absent.

Roentgenograms of the chest revealed the cardiac silhouette increased in all diameters especially in the region of the left ventricle. There was an increase in the supracardiac dullness particularly in the region of the ascending portion of the aorta, consistent with the diagnosis of specific aortitis or aneurysm of the aorta. The findings in the lungs were due to congestive changes.

The red blood count was 4,450,000 per cubic millimeter with a hemoglobin of 92 per cent. The white blood count was 8100 per cubic millimeter with normal differential. The fasting blood urea was 15 mg. per cent. The Wassermann and Kahn reactions were positive on three occasions. Repeated urinalyses revealed only an occasional slight trace of albumin.

An electrocardiogram, taken shortly after entry (figure 1C), revealed a partial (2:1) heart block in Leads I and IV and in Leads II and III a complete auriculoventricular dissociation with bigeminy due to alternate ventricular extrasystoles. The
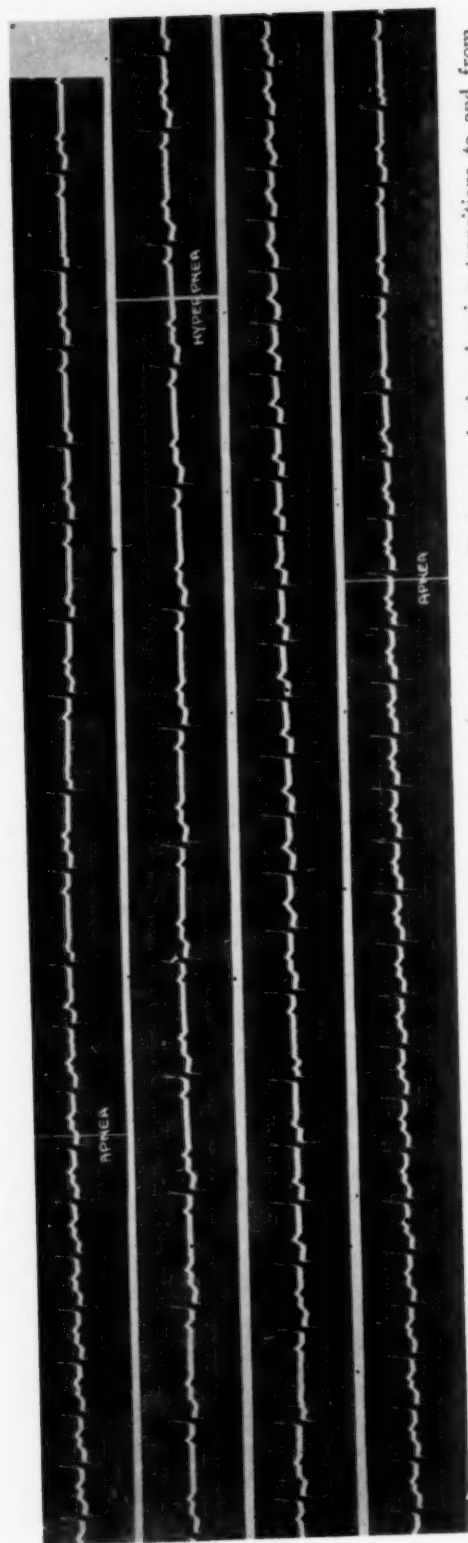
FIG. 2. Electrocardiogram, Lead II. Continuous tracing through a complete cycle of Cheyne-Stokes respiration showing transitions to and from partial (2:1) heart block.

Q-R-S complexes were slurred and showed left axis deviation. In Leads I and II the S–T segments were depressed and the T-waves diphasic. In the precordial lead, the T-wave was still inverted.

The diagnosis was syphilitic heart disease, cardiac hypertrophy and dilatation, aneurysm of the ascending aorta, aortic insufficiency, transient heart block, class III.

Electrocardiographic Observations

Numerous clinical and electrocardiographic observations under varying circumstances were made on this patient and the effect of various drugs was noted. All electrocardiographic studies were made on Lead II and control records were taken usually a half-hour before studies with different drugs or procedures. Only the more pertinent observations are presented.

Figure 2 (obtained after two days of hospitalization) is fairly representative of numerous control tracings and shows a continuous record taken during a complete cycle of Cheyne-Stokes respiration. The onset of apnea and hyperpnea was accurately recorded. At the end of the hyperpneic phase, the record shows a delayed auriculoventricular conduction (P–R equal to 0.30 second), depressed S–T segment, inverted T-wave and a ventricular rate of 83 per minute. With the onset of apnea, there occurs a rapid increase in the P–R intervals from 0.30 to 0.56 second following which 2 : 1 partial heart block appears. In the early stages of apnea, the rhythm alternates between a 2 : 1 heart block and a partial heart block with a prolonged P–R interval of 0.56 second; in the later stages there is a persistent 2 : 1 heart block. The ventricular rate decreased from 83 to 37 per minute and of particular interest are the further depression of the S–T segments and the greater inversion of the T-waves toward the end of apnea. During hyperpnea, progressive changes in the opposite direction take place. The ventricular rate increases, the degree of auriculoventricular conduction disturbance decreases, and the S–T segments and T-waves become slightly more elevated.

In reviewing the control tracings, it was found that in general, with the onset of apnea, the P–R interval increased until a 2 : 1 heart block appeared. On one occasion, complete auriculoventricular dissociation developed at the end of a prolonged period of apnea. The degree of auriculoventricular block always decreased with the restoration of breathing. There was a marked variation in the interval between the onset of apnea and the development of the abnormal rhythm. This was later correlated with the effects of digitalis. With rapidly increasing doses to the point of toxicity, the abnormal rhythm began to appear earlier in the apneic phase. Resnik and Lathrop [3] attribute this to the increase of vagal tone by digitalis.

Studies by Anthony, Cohn and Steele [4] on changes in the blood gases during Cheyne-Stokes respiration indicate that the lowest concentration of oxygen occurs at the beginning of the respiratory phase. The changes in the T-waves and in the S–T segments in our case were progressive in character and the maximum deviations were observed when the oxygen content was at its lowest level. These findings are consistent with the electrocardiographic changes found in experimentally induced generalized anoxemia.[5, 6]

The Effect of Various Therapeutic Measures

1. Atropine. It has been adequately demonstrated by Greene and Gilbert [7] that the conduction disturbance in these cases is due to a central stimulation of
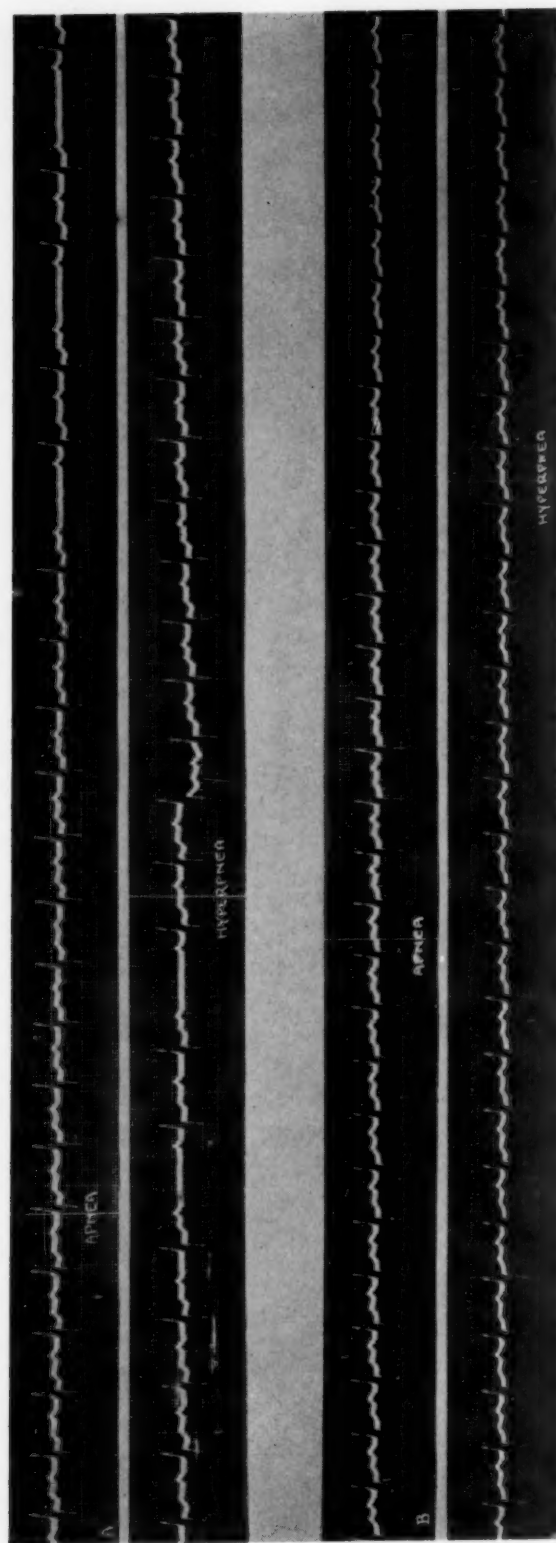
FIG. 3 *A.* Electrocardiogram, Lead II. Continuous tracing showing changes in rhythm during the apneic phase. *B.* Strip taken two minutes following intravenous injection of 1/50 grain of atropine sulphate.

the vagus nerves by anoxemia. Atropine was administered intravenously on four occasions in doses varying from 1/30 to 1/75 of a grain and tracings were obtained at intervals of 2, 5, 15, 30 and 60 minutes. On each occasion, atropine completely abolished the cyclic changes in cardiac rhythm without affecting the Cheyne-Stokes respiration.

Figure 3A is a continuous strip of Lead II beginning at the end of a hyperpneic phase of Cheyne-Stokes respiration and extending through the entire apneic phase into the succeeding period of hyperpnea. The ventricular rate during the respiratory phase is 81 per minute and the P–R interval 0.28 to 0.30 second. During apnea there is a gradual lengthening of the P–R interval and the development of 2 : 1 heart block. Figure 3B is a strip taken two minutes after the intravenous administration of 1/50 of a grain of atropine showing persistent Cheyne-Stokes respiration without transient heart block. The ventricular rate is 86 per minute and the P–R interval 0.24 second.

2. *Theophylline-Ethylenediamine.* Vogl,[8] in 1927, first introduced euphyllin as a means of abolishing Cheyne-Stokes respiration and relieving the associated subjective distress, and summarized his experience five years later by stating that the drug never failed to bring about a normal type of respiration. Several investigators have confirmed these observations and have been almost as enthusiastic in their claims [9-12] although at the present time neither the effective component nor the exact mode of action of the drug is clear. Aminophyllin was administered intravenously in doses of 0.48 gram dissolved in 10 c.c. of saline on three occasions. In this patient, the injection abolished the apneic periods but periodic waxing and waning of respiration still persisted and during the latter, partial heart block still appeared. On one occasion, the additional injection of 0.24 gram failed to restore the respiratory rhythm to normal. The effect on respiration never lasted more than a half-hour and the patient was unaware of any subjective improvement.

3. *Caffeine Sodio-Benzoate.* Experimentally, the effects of caffeine are complex and depend on the dosage and the conditions under which it is used. Its principal effect appears to be vasodilatation combined with stimulation sufficient to maintain and at times elevate the blood pressure.[13] It has been demonstrated that caffeine produces a definite cerebral vasodilatation.[14] Clinically, it has been stated that " caffeine—rarely, if ever, restores normal breathing." [10] In our case caffeine sodio-benzoate was administered intravenously on three occasions in doses of 15 grains and tracings were obtained at five minute intervals for a half-hour. On each occasion, caffeine abolished both the Cheyne-Stokes respiration and the periodic heart block.

Figure 4A shows part of a record taken during apnea with partial heart block and a ventricular rate of approximately 45 per minute. Figure 4B is part of a tracing taken 10 minutes after the intravenous injection of 15 grains of caffeine sodio-benzoate. The ventricular rate is 83 per minute and the P–R interval 0.26 second.

4. *Morphine.* Cheyne-Stokes respiration has been produced experimentally by the administration of morphine. Electrocardiograms in these cases showed central vagal stimulation with sino-auricular and auriculoventricular block which could be abolished by atropine. Clinically, it has long been appreciated that patients with cardiac decompensation are quite often thrown into Cheyne-Stokes respiration by morphine.
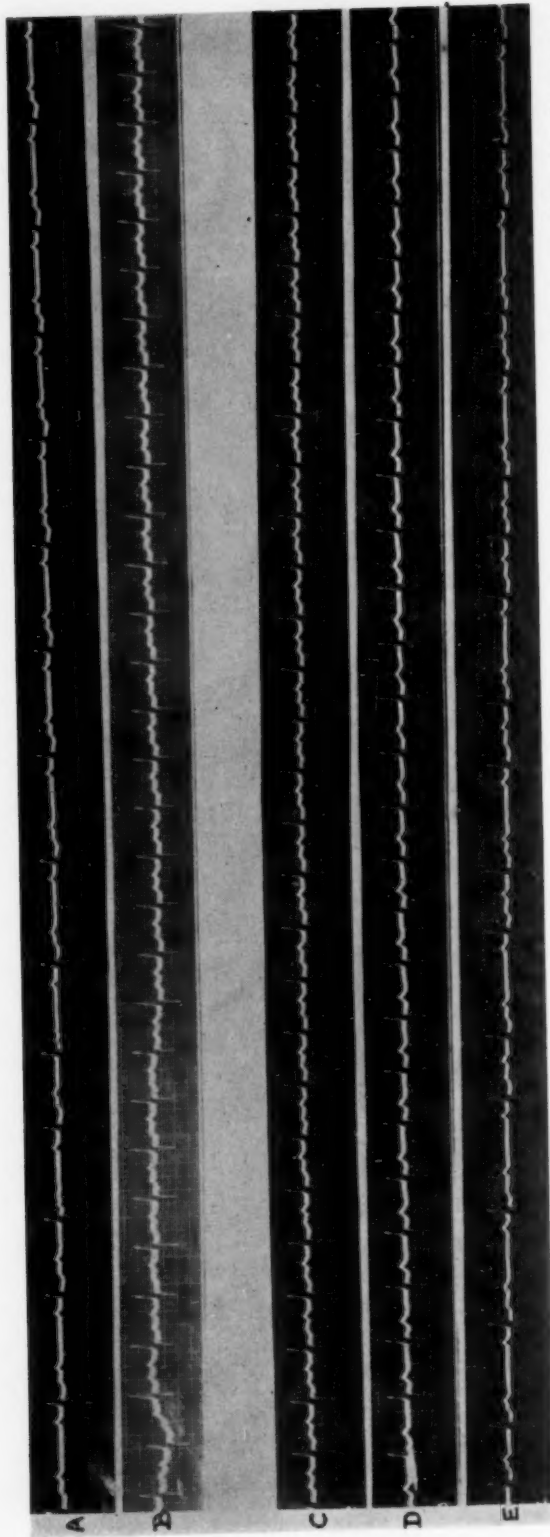
Fig. 4 *A*. Electrocardiogram, Lead II. Control strip taken during portion of apneic phase. *B*. Strip taken 10 minutes following intravenous injection of 15 grains of caffeine sodio-benzoate. *C*. Control strip taken during normal respiration. Rate 80 per min., P-R interval 0.28 sec. *D*. Tracing taken during apneic phase one hour after administration of 1/4 grain of morphine sulphate. Rate 77 per min., P-R interval 0.44 sec. *E*. Tracing taken during apneic phase one hour after the preceding record.

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Following admission to the hospital, the patient had received 1/4 grain morphine at bedtime to allay restlessness and alleviate his dyspnea. On May 12, the morphine was discontinued and the next day clinical examination revealed normal respiration which persisted until May 16 when Cheyne-Stokes respiration reappeared. It was found that the patient had received 1/4 grain of morphine the night before for dyspnea. On May 17, a tracing was obtained during normal respiration and 1/4 grain of morphine was administered subcutaneously. Tracings were taken at half-hour intervals. Figure 4C shows part of the control tracing taken before morphine was given. The ventricular rate was 80 per minute and the conduction time 0.28 second. An hour later, Cheyne-Stokes respiration was present and figure 4D was taken during the apneic phase. The ventricular rate was 77 per minute and the P–R interval was 0.44 second. Two hours later the tracings revealed periodic heart block during the apneic phases of Cheyne-Stokes respiration (figure 4E). The experiment was repeated on May 18 with almost identical results.

5. *Acetyl-Beta-Methylcholine Chloride (Mecholyl)*. Because of its parasympathomimetic effects and the fact that it occasionally produces various degrees of heart block, mecholyl was given subcutaneously dissolved in water, in doses of 25 mg. on three occasions and 50 mg. on one occasion. Although the patient showed the usual systemic effects of the drug, it failed to influence the P–R interval or produce any degree of auriculoventricular block. The 50 mg. dose did, however, produce numerous ventricular extrasystoles from a single focus which were readily abolished by 1/50 grain of atropine intravenously.

6. *Digitalis*. In view of the characteristic effect of digitalis on the vagus nerves and the frequency with which it has been associated in the reported cases of transient arrhythmias associated with Cheyne-Stokes respiration [1] the patient was given 4½ grains of digitalis by mouth daily starting May 22. On May 29, after he had received 31½ grains and was complaining of nausea, clinical and electrocardiographic studies again revealed Cheyne-Stokes respiration with periodic heart block during apnea.

The effect of the following drugs was studied because of their supposed circulatory and respiratory actions:

Strychnine sulphate gr. 1/60 subcutaneously.

Epinephrine hydrochloride ½ and 1 c.c. of 1 : 1,000 dilution subcutaneously.

Glucose (50 per cent), 50 and 100 c.c. intravenously.

Nitroglycerine gr. 1/100 sublingually.

Paredrine hydrobromide* orally in doses of 60, 80 and 100 mg.

None of these drugs produced any appreciable effect on the Cheyne-Stokes respiration or the associated arrhythmia.

THE EFFECT OF CAROTID SINUS STIMULATION

The predominant effect obtained on numerous trials was slowing of the ventricular rate as a result of depression of both the sino-auricular and auriculoventricular nodes. Figure 5 is a continuous strip of Lead II showing the effect

* The paredrine hydrobromide was supplied by Smith, Kline and French Laboratories of Philadelphia.
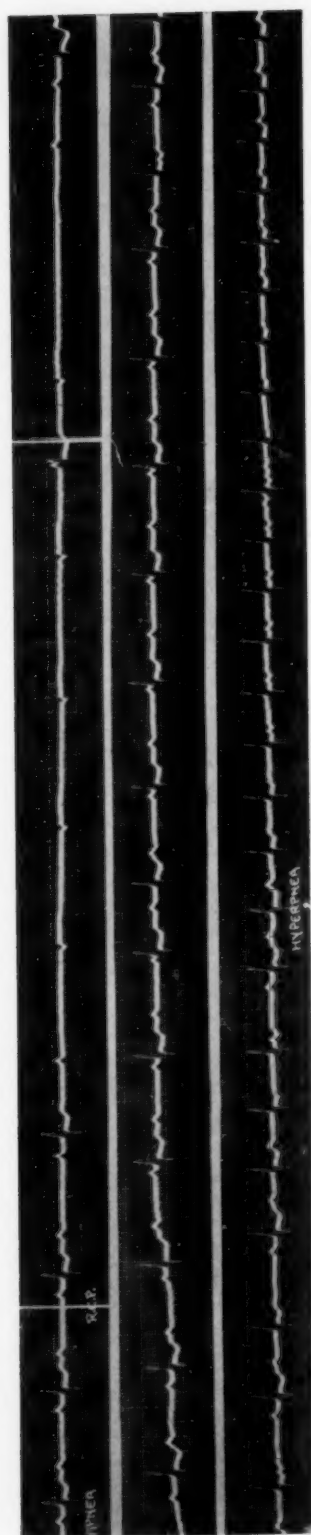
Fig. 5. Electrocardiogram, Lead II. Continuous tracing showing effect of pressure on the right carotid sinus (R.C.P.).

of right carotid sinus pressure applied during a period of apnea. Sinus slowing, ventricular and sino-auricular standstill, marked variation in size and shape of the auricular complexes and complete auriculoventricular block are present. During ventricular standstill, ventricular escape from an ectopic focus occurred. These changes were somewhat more pronounced on right than on left carotid sinus pressure. Repeated observations on the effect of carotid sinus stimulation during digitalization revealed a progressive sensitizing action on the vagal reflex. A rather interesting finding was the prolonged period of apnea which developed upon the return of ventricular activity. The duration varied from 40 to 60 seconds. Whether this was due to the sudden elevation of pressure in the carotid sinus and the abrupt return of blood flow through the respiratory center or to the return to the respiratory center of blood which had been over-oxygenated in the pulmonary vessels during the period of asystole is uncertain.[15]

EFFECT OF OXYGEN

There is sufficient evidence to support the theory that oxygen deficiency may play an important rôle in the production of Cheyne-Stokes respiration. Clinically, observers have obtained marked variation in the response to oxygen therapy, a result which may be correlated with the variation in oxygen saturation of the blood in different patients with periodic breathing. On two trials, 50 per cent oxygen administered via the open Burgess box [16] quieted the patient's breathing and resulted in subjective improvement without influencing the periodic changes in cardiac rhythm. Oxygen administration did not abolish the periodic breathing even when the oxygen content was raised to a level of 95 per cent for a period of six hours.

DISCUSSION

This case afforded an unusual opportunity to study the factors influencing the occurrence and disappearance of heart block associated with Cheyne-Stokes respiration. The observations that digitalis, morphine and carotid sinus pressure, which are known to increase vagal tone, either induced or accentuated the heart block while atropine abolished the block, confirmed the vagal origin of the periodic variations in rhythm. The failure of epinephrine, 50 per cent glucose and paredrine to modify the block supports the view that the vagus is the mechanism by which the block was produced.

Contrary to usual experience, caffeine sodio-benzoate was the only measure which restored normal breathing and coincidentally abolished the transient heart block in this patient. Whether this was due to stimulation of the respiratory center is problematical. Oxygen administration resulted in subjective improvement without affecting the periodic respiration while aminophyllin, except for a slight modification of the type of respiration, was ineffectual. The failure of mecholyl to reproduce the heart block was attributed to the individual variation in response to the drug.

SUMMARY

A case is reported showing transient A–V block during the apneic phase of Cheyne-Stokes respiration. The effect of various drugs and procedures on the heart block is discussed.

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IDIOPATHIC APLASTIC ANEMIA WITH RECOVERY *

By George S. Mirick, M.D., *New York, N. Y.*

It is well known that recovery from "idiopathic" aplastic anemia is extremely unusual. Wintrobe [1] was able to find only six cases in his review of the literature. We report here a seventh cured case which we feel to be true idiopathic aplastic anemia.

Case Report

A. T., a 30-year-old, married, white male, sugar refinery worker was admitted to the hospital on April 14, 1937. His presenting complaints were weakness and pallor for three months. The family history was negative. He had measles as a child, influenza in 1919, and a rather acute diarrhea for one week in 1927. He had been employed for the last three years as foreman in a sugar warehouse, exposed to dust but no chemicals. One year before the present illness the patient had boiled some crude coal tar in his cellar. All of the windows were tightly closed and he was exposed to the choking fumes for about one hour. There was no immediate ill effect from this nor are such fumes considered a cause of aplastic anemia. There was no history of exposure to roentgen-ray, radium, benzol, arsenobenzol, acetarsone, benzedrine, sulfanilamide, gold salts or any other drugs or industrial poisons. The patient's wife, child and fellow workers have remained well.

In January 1937, about three months before entry, the patient's associates commented on his pallor. Shortly after this he noted increasing fatigue, exertional dyspnea, palpitation and pounding in the ears. He continued to work but the symptoms progressed with added dizziness on rising, tingling of the fingers and on occasion a few crops of petechiae. His doctor diagnosed anemia which did not respond to parenteral liver injections so that he was sent to the hospital.

Physical examination on admission showed a vigorous, healthy looking, but very pale young man. Temperature 37.8° C. by rectum, pulse 118, respirations 22, and blood pressure 125 mm. of Hg systolic and 65 diastolic. There were recent hemorrhages and small plaques of grayish-white exudate along the vessels in both fundi and a few petechiae in the conjunctivae, and on the soft palate. The heart seemed a little enlarged. There was a loud systolic murmur. A normal liver edge was palpable about two fingers'-breadth below the costal margin. Spleen was not palpable. There was no other evidence of hemorrhage, no jaundice, or papillary atrophy of the tongue, and neurological examination was normal.

Examination of the blood showed: red blood cells 1.41 million; hemoglobin, 38 per cent (Sahli); white blood cells 3,800 with 30 per cent polymorphonuclears, 4 per cent of which were banded, and 70 per cent lymphocytes. Packed cell volume equaled 10.5 per cent. Hematocrit studies showed: M.C.V. 71; M.C.H. 40; M.C.H.C. 57. Bleeding time was over 10 minutes. There were 21,150 platelets per cubic millimeter and reticulocytes equaled 3.7 per cent of the red blood cells.

Urine, stool and blood Wassermann test were negative. Direct Van den Bergh test was negative and the indirect test showed 0.81 mg. %. Icterus index was 5.7 units. Gastric analysis, following histamine, yielded a maximum ten-minute volume of 47 c.c., free acid 86 degrees, and total acid 108 degrees. A petechiometer test showed spots to appear on the upper forearm in one minute at 20 mm. of Hg suction. A control was negative in this time at 40 mm. suction. Chest roentgenogram showed

the lungs to be clear, but the left ventricle was somewhat enlarged. Roentgenograms of the bones revealed nothing unusual. A blood culture was negative. A sternal marrow biopsy was done on April 20 and the specimen was described by Dr. Wyckoff as follows: " The cellularity of the marrow is very considerably reduced. Some areas of the stroma contain but a few scattered hematopoietic cells. In other parts the stroma is reduced to narrow bands between large fat cells. Megakaryocytes are few. No considerable erythropoietic foci are seen. Those found are small and imperfect. Fairly numerous endothelial phagocytes (histiocytes) are found. The cytoplasm of these cells contains pigment. Conclusion: Aplasia of the marrow."
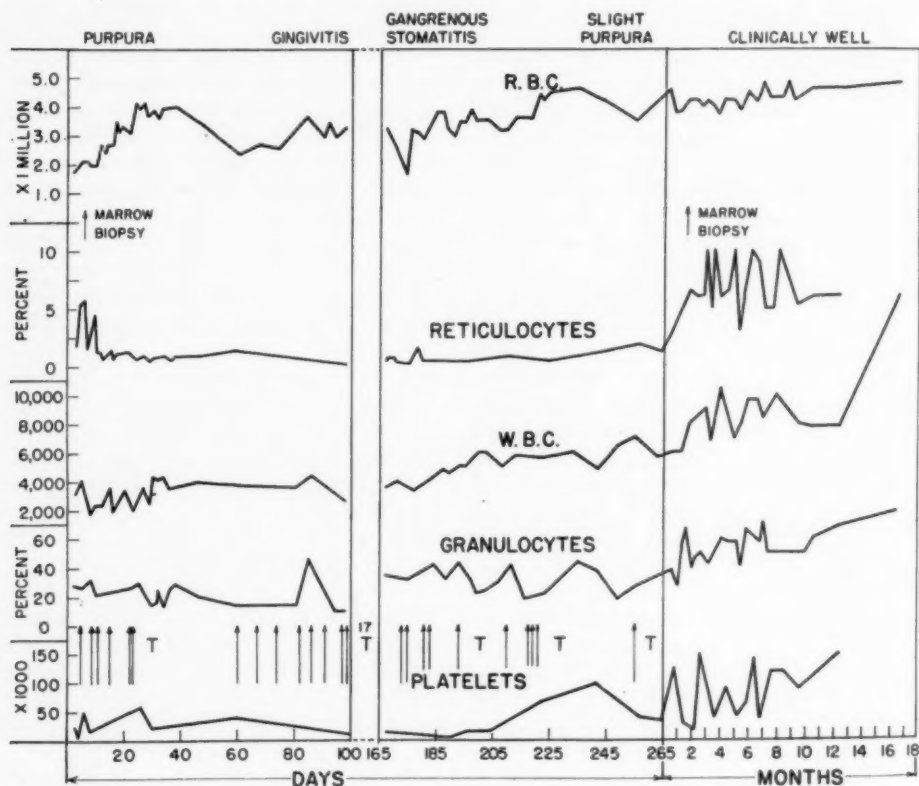

CHART 1. Hematological findings in patient A. T.   (T represents transfusion.)

The patient was fortunate in having plenty of blood donors at his disposal. His treatment and course in the hospital are summarized in the accompanying chart which covers 25 months' observation. He received 41 blood transfusions in the first nine months, totaling about 20 liters of citrated blood. Other treatment consisted of bed rest and nursing care, high vitamin diet, ferrous sulfate 1.2 gm. daily, 100 gm. of raw liver daily for the first three months, and brewers' yeast 3 gm. daily during convalescence. His course was exceedingly stormy for eight months after admission. Purpura, prolonged bleeding time, anemia, and neutropenia persisted despite transfusions. There was an initial fever which fell to near normal in the first six weeks of observation. During the fourth month he developed a severe gingivitis with loosening of all the teeth, much pain, high fever, general toxicity, swollen tongue and edema of

the face. There gradually developed an immense gangrenous lesion involving the gums and soft palate near the right back teeth. This had the characteristic foul odor of a gangrenous naso-pharyngitis and smears showed Vincent's organisms. For a time the patient seemed desperately ill.

During October and November 1937 a change for the better took place. The blood returned toward normal, with a rise in erythrocytes, hemoglobin, total white count, percentage of granulocytes and platelets. Interestingly, there was no reticulocytosis until later. The hematological improvement was mirrored in the clinical condition, the temperature falling to normal, rapid healing of the gangrenous mouth lesions, disappearance of purpura and gain in strength.

A second sternal biopsy in February 1938 showed that: "The stroma of the marrow is moderately cellular in distinct contrast to the all but aplastic marrow obtained from the sternum on April 20, 1937. In some areas of the section fairly well defined foci of active red cell formation are found. The surrounding stroma contains leukogenic cells in moderately active multiplication. An occasional megakaryocyte is found."

The patient's convalescence was smooth and sustained. He returned to his work apparently cured in September 1938, 18 months after his first entry and 21 months after the onset of his disease. Our last blood count showed: red blood cells 4.85 M., hemoglobin 98 per cent; white blood cells 17,500, with polymorphonuclear neutrophiles 73 per cent (banded 6 per cent, segmented 67 per cent), eosinophiles 4 per cent, basophiles 1 per cent, lymphocytes 15 per cent, monocytes 7 per cent and reticulocytes 9 per cent.

Wintrobe comments upon the fact that in all of the six other reported patients with idiopathic aplastic anemia who have lived for over one year some abnormality of the blood has persisted. There has been either moderate anemia, leukopenia, thrombopenia or combinations of them. In our patient a reticulocyte count of between 5 and 10 per cent persisted for one year. There has been no subsequent purpura but the platelets have never returned entirely to normal levels, ranging between 50 and 150 thousand per cubic millimeter. The red cells were still macrocytic and hyperchromic one year after the first observation.

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TOTAL THYROIDECTOMY FOR CONGESTIVE HEART FAILURE AND ANGINA PECTORIS; REPORT OF A CASE *

By SIM FIELDS BEAM, F.A.C.P., *St. Louis, Missouri*

CHRISTIAN [1] stated in 1925 that possibly a lowered metabolic rate as a result of thyroid deficiency might afford a cardiac rest in that it lessened appreciably the demands on the heart. He also made the observation that those suffering from myxedema often developed symptoms of angina pectoris upon administration of thyroid, with subsequent improvement upon withdrawal of the thyroid.

In 1927 Levine [2] did a subtotal thyroidectomy for masked hyperthyroidism

on a patient in cardiac failure. Great improvement followed but upon careful microscopic examination of the removed gland no areas of hyperactivity of the gland could be found.

Upon the basis of previous exhaustive work by Blumgart and his associates on the blood velocity in its relation to metabolic activity Blumgart[3] states that the " adequacy of a given velocity of blood flow cannot be decided in absolute terms. It can only be evaluated in relation to the metabolic demands of the particular patient." The basal metabolism in cardiac failure is normal, yet the blood velocity is slow. In those suffering with myxedema the metabolic rate is low and the blood velocity is also retarded. Hence it follows that if the metabolic rate could be lowered sufficiently to enable the slowed blood velocity to take care of the demands put upon it the cardiac failure would be greatly relieved.

The first such operation was done at the Peter Bent Brigham Hospital in Boston in 1932. Since that time the procedure has been critically reviewed and is now used with increasingly more careful judgment. In fact there is much criticism of the entire rationale in some quarters, and in a few it has been discarded. The consensus of opinion at the present time favors the operation for angina pectoris but feels that it is questionable in congestive failure. Parsons and Purks[4] in a paper in which they quote personal communications from various men state that Mont Reid, Moore and Trout do not feel that the procedure is justified, and that Clute is not convinced of its efficacy, while Pemberton feels that it is sound from a physiological standpoint and Brenzer is in favor of it.

One of the greatest problems is the selection of the proper cases. It is felt by all that the operation is too radical for any case that has not been carefully tried first on all proved medical therapy and has not responded satisfactorily. It is then and only then that one is justified in proceeding with the measure. In congestive failure the operation should not be performed on those with any active cardiac lesion or rapidly progressing failure. Active rheumatic heart disease and even latent luetic heart disease are definite contraindications. Advanced cirrhosis of the liver is obviously a contraindication. Renal function must be adequate without evidence of abnormal nitrogen retention.

In the selection of cases of angina pectoris the considerations in addition to the above must deal with the economic problem. Only if the pain occurs when the patient is at rest or when it interferes with his only means of livelihood should he be considered seriously. If there has been a recent coronary occlusion the operation is certainly not indicated.

The preoperative basal metabolic rate is of great significance. One below minus 15 per cent offers less chance for relief than one higher, and operation is not advisedly offered when the basal metabolism is minus 20 per cent or lower. Other instances present difficulties in determining whether slightly elevated rates are due to a masked hyperthyroidism or occur with a normal thyroid gland. Levine and Eppinger[5] cite an instance where the basal metabolic rate was as high as plus 45 per cent, yet careful pathologic section of the gland failed to reveal any evidence of overactivity.

After operation, as the extremely low basal metabolic rates develop and symptoms of myxedema sufficiently profound to cause discomfort ensue, small doses of thyroid are indicated. It is best to keep the basal metabolic level around minus 20 per cent. However, many of these patients, even those not so

afflicted prior to operation, are unable to tolerate thyroid medication without the appearance of angina pectoris symptoms. In such cases the thyroid is immediately withdrawn; in each case the administration of thyroid is entirely an individual problem.

Levine and Eppinger [5] find that with the lowering of the basal metabolic rate the blood velocity (sodium dehydrocholate method) either remains the same or increases. While theoretically this does not seem altogether logical it is found to be clinically true. Hence the improvement in the cardiac state.

Significantly, the blood cholesterol has been found to rise proportionately with the reduction in basal metabolic rate. There is often a high preoperative blood cholesterol level, the cause of which is not understood.

Stern and Altschule [6] point out that as the basal metabolic rate falls to minus 20 or 30 per cent a slight secondary anemia develops, of a macrocytic, hyperchromic type. In those in whom there is some degree of emphysema the anemia is not so great. In no case is the anemia so great as to cause any symptoms. The cause of the anemia is not established, although it is probably due to a decreased function of the bone marrow. The anemia does not respond to either liver or iron, but upon administration of thyroid shows improvement. There is also a lowering of the total white count which, however, responds normally to infection.

The effect of the procedure on blood pressure is not significant. While immediately following the operation there may possibly be a slight drop in pressure this may be due to the bed rest imposed by the procedure. Some time after the operation Levine and Eppinger [5] found the pressures possibly a little elevated over the preoperative level but not to a clinically significant extent.

The heart size has been found to increase gradually but whether this is due to the myxedema or to the gradual progression of the cardiac lesion is a problem for conjecture. It is certainly true that the myxedematous heart does enlarge gradually but whether either factor alone is responsible is a question that is not clear. Claiborne and Hurxthal [7] in their series of cases made note of the fact that there was no increase in heart size following the onset of the myxedema.

It is felt by many that the relief from pain in angina pectoris is due to the interruption of the sensory nerves of the heart rather than to the thyroidectomy itself. It is certain that the immediate dramatic relief of pain could not be due to the physiological results of the thyroidectomy, for the basal metabolic rate does not reach its effective level prior to two or three weeks after the operation. Weinstein and Hoff [8] point out that the superior and middle cardiac nerves of the sympathetic system and the superior rami of the vagus nerves are in close contact with the posterior capsule of the thyroid gland and contribute to the nerve supply of the thyroid gland. Moreover, they found that when only one lobe was removed relief from pain was obtained only on that side. Dissections in this region disclosed that the superior cardiac nerve lies in close apposition to the posterior capsule in 70 per cent of the cases and the middle cardiac nerves in 20 per cent of the cases. These authors concluded that the early relief of pain was due to the interruption of these nerves rather than to the reduction of thyroxine in the circulation.

Ochsner and Gillespie,[9] while recognizing the interruption of the sensory nerves as a factor in the relief of the pain in angina pectoris, also feel that the

smaller amount of work demanded of the heart, the decreased sensitivity to adrenalin, and the generalized decreased vasomotor tone are equally if not more important factors.

The present general feeling is that the procedure is justified in intractable cases of angina pectoris but is of doubtful value in congestive heart failure. Parsons and Purks [4] report a series of 392 cases gathered from 59 different sources (personal communications and reported in the literature). Of these, 229 were done for congestive failure with an operative mortality of 10.48 per cent. Of the remaining cases 34.63 per cent showed excellent results, 28.78 per cent moderate improvement, 2.92 per cent slight improvement and 33.63 per cent failures or no improvement. In the series of cases done for angina pectoris there was an operative mortality of 3.75 per cent, with the remaining cases showing excellent results in 55.46 per cent, moderate improvement in 28.12 per cent, slight improvement in 3.92 per cent and unsatisfactory results in 12.5 per cent. Weeks,[10] in a series of 100 cases of angina pectoris, reports an immediate operative mortality of 3 per cent with a later mortality of 15 per cent not related to the operation itself. Of the remaining cases 51.2 per cent were markedly improved, 40.2 per cent moderately improved and 8.5 per cent failures. McCreery [11] reported a series of 150 cases done for congestive failure, with an immediate operative mortality of 9.3 per cent, late but not operative deaths of 16 per cent, markedly improved 41.9 per cent, moderately improved 39.2 per cent, and no improvement 18.7 per cent. Hence it is readily seen in each series that the results were definitely better in those cases suffering from angina pectoris. On the other hand, worthwhile results were obtained in those with congestive failure; and when one is faced with the fact that medical therapy has been pushed to the utmost in all cases subjected to this heroic procedure it should not be discarded as useless in congestive heart failure.

The postoperative complications of tetany and injury to the recurrent laryngeal nerves are relatively infrequent. No doubt as the procedure becomes more common the incidence of such complications will become even less. Parsons and Purks [4] state that in the series they collected there was transient tetany in 10.3 per cent with only one fatality, and injury to the recurrent laryngeal nerve in 8.2 per cent which also was transient and offered no difficulties.

Cohen and Hermann [12] in making a social study on a group of 47 cases that had survived the operation at least one year found that 40 of these patients had experienced definite improvement and lived with greater ease and activity. Twenty-three of the group had been able to resume remunerative work or to take up complete housework for a period of three months to two and a half years. They report that half of the congestive failure cases and a slightly smaller percentage of the angina cases presented the best results. It is finally concluded from this study that the procedure, on the whole, is a definite economic aid and is entirely worthwhile from a social and economic standpoint.

CASE REPORT

E. J., a 51-year-old white female, was first seen at St. Luke's Hospital, St. Louis, Missouri, in January 1932, suffering from cholecystitis with jaundice. At the time of admission she gave a history of scarlet fever in childhood. In the weeks prior to admission she had suffered from dyspnea, occasional orthopnea, and edema of the ankles. Upon examination a rough systolic murmur was heard over the mitral area,

with an accompanying apical thrill, blood pressure 90 mm. Hg systolic and 78 mm. diastolic. In addition she was jaundiced; the liver was found to be about two to three fingers'-breadth below the right costal margin; and there was tenderness in the right upper quadrant. A cholecystectomy and appendectomy were performed in February 1932, at which time gall-stones were found. Postoperatively pleurisy developed on the left side and a stormy course ensued. An electrocardiogram at the time was normal. In April 1932 she definitely decompensated but responded readily to digitalization. The electrocardiogram was again normal, and the rate regular, but the blood pressure hovered around 140 mm. Hg systolic, and 85 mm. diastolic. In August of 1932 precordial pain was first noticed following exertion. In October of the same year a subtotal hysterectomy was done because of fibromyomata, with a right sided pneumonia developing 10 days after operation. From this she recovered without cardiac decompensation. The heart remained regular, and the basal metabolism was plus 12 per cent. At this time the notation was made that the pulse remained in the region of 100 per minute even though digitalis was pushed to toxicity. In March 1933 she appeared in the clinic with threatening decompensation, and was hospitalized in April with disabling decompensation. It was at that time that, fibrillation was first noticed and that the electrocardiogram showed signs of myocardial injury. The blood pressure was found to vary between 120–140 mm. Hg systolic and 70–90 mm. diastolic. Following a month in the hospital, where she was treated symptomatically and by bed rest, she was discharged. During the next four to five months she presented herself at the clinic frequently with complaints of dyspnea, edema, orthopnea, and signs of myocardial failure. On September 2, 1933 she was admitted to the hospital with a large pleural effusion on the right which necessitated draining on September 2, October 9, and October 24, about 20 ounces of fluid being removed each time. The blood pressure had risen to 165–190 mm. Hg systolic and about 110 mm. diastolic, at which levels it maintained itself during her hospital stay. From then until January 1934 she was admitted to the hospital at increasingly shorter intervals for thoracentesis until it was finally necessary to keep her in the hospital constantly because she was unable to go back and forth to her home.

At the time operation was contemplated her vital capacity was found to be about 2400 c.c. The blood velocity by the intravenous Decholin method was 30–39 seconds. The blood N.P.N. was 28 mg. per cent. The patient was orthopneic, but upon complete bed rest the edema disappeared, the fluid disappeared from the right chest, and the patient was considerably more comfortable. The heart continued to fibrillate at a moderately rapid rate; the heart sounds remained unchanged; and the electrocardiogram showed myocardial damage. Basal metabolism before operation was plus 10 per cent and plus 0.5 per cent on two different occasions. The blood pressure was 160 mm. Hg systolic and 90 mm. diastolic. Total thyroidectomy was done February 9, 1934 without complication except for slight injury to the recurrent laryngeal nerve. Within two weeks the patient was able to sleep flat in bed, the pulse had slowed to 72 but was still fibrillating, and while there was a friction rub at the right base there was no fluid. There was no elevation of temperature following the procedure. The blood velocity was 32 and 33 seconds by the Decholin method on two occasions. The basal metabolic rates were as follows:

Feb. 21, 1934   Minus 1   per cent
March 1, 1934   "   8   "   "
March 9, 1934   "   13   "   "
March 19, 1934   "   15   "   "
April 6, 1934   "   22½ "   "   Discharged from hospital

The thyroid gland was found to be entirely normal on pathological section. Digitalis was omitted, and the pulse remained in the seventies although fibrillation con-

tinued without interruption.   The blood pressure was around 150–160 mm. Hg systolic
and 90–100 mm. diastolic.   However, in May of 1934 she was digitalized again and
was more comfortable.   In June 1934 the basal metabolism was found to be minus
6 and minus 3 per cent on two occasions; hence, roentgen-ray therapy was given for
any thyroid tissue that might have been overlooked inadvertently.   In August of 1934
the basal metabolic rate was minus 8 per cent.   However, she felt definitely improved,
was able to take care of all her housework except the heavy mopping and sweeping, and
slept flat in bed.   Occasionally she had some edema of the ankles but never a great
deal, and at no time did she have pleural effusion.   She did have dyspnea on exertion
and was never able to walk long distances.

In December of 1934 the blood pressure reached 190 mm. Hg systolic and 100
mm. diastolic, at which approximate levels it remained until death.   She was unable to
tolerate thyroid in any considerable dosage without the occurrence of anginal pains.

Through 1935 she was very comfortable, being able to work around the house and
do about as she desired.   However, she was never able to be without digitalis.   She
also insisted upon having the so-called coronary dilators.   If these were omitted and
another tablet substituted in their place without her knowledge she would invariably
call within the next day or so stating that she was having anginal symptoms and asking
if the medicine had not been changed.

In 1936 she began to show her first signs of failure, more dyspnea upon exertion,
slight orthopnea, and some precordial distress on slight exertion.   In February of 1936
her basal metabolism was minus 7 per cent.   In spite of these relatively normal read-
ings she complained of feeling cold and always wore extra clothing in an effort to
keep warm.   Her skin and hair were dry and coarse.   There was a mild secondary
anemia and the blood cholesterol was found to be elevated, remaining in the region
of 300 mg. per cent.

In 1937 and 1938 her course was gradually downhill.   The basal metabolism was
minus 30 per cent in January 1938.   It was not until the spring of 1938 that she again
developed pleural effusion which even then was not sufficient to necessitate thoracen-
tesis and was later absorbed.   In November of 1938 she was forced to enter the
hospital in marked decompensation.   During her stay there until April of 1939 she
was never able to tolerate a basal metabolism.   In January of 1939 she developed a
right pleural effusion which never reached large proportions.   She died May 20, 1939.
At autopsy no evidence was found of the thyroid gland.   The heart was enormously
enlarged, and the valves revealed definite rheumatic involvement.   There was a small
pleural effusion on the right, and the liver and lungs showed the expected findings of
congestive heart failure.

Critical review of the roentgen-rays of the chest for heart size during the years
revealed that there was a slight additional enlargement of the heart just following the
thyroidectomy, but from then until the time of death the heart remained approximately
the same in size.

COMMENT

Total thyroidectomy for heart failure and angina pectoris is a valuable pro-
cedure as evidenced from the reports in the literature and this particular case.
It has a sound physiological basis and the clinical results have been definitely
favorable.   While the statistics in the literature report better results in angina
pectoris the results in congestive heart failure are encouraging and do offer relief
to a large percentage of cases.

It is to be noted that the blood velocity, blood pressure and heart size are
little changed by the procedure.   Yet the demands made upon the heart are

definitely lessened by the reduction of the metabolic rate and hence aid the failing heart considerably.

This particular case calls attention to the observation made by Christian [1] that the use of thyroid in the myxedematous heart may bring on signs of angina pectoris. Also, in the discussion of the so-called coronary dilators this patient apparently gives clinical evidence of their value.

From the social and economic point of view the procedure deserves particular consideration. In this instance it was of vital importance that life be spared as long as possible in order that the patient might help raise her orphaned grand-children. With an added five years of activity she was able to give much needed assistance. As pointed out by Cohen and Hermann [12] the social and economic significance of the measure is well worth serious consideration, and its use is often justified from that standpoint.

CONCLUSIONS

1. Total thyroidectomy for angina pectoris and congestive heart failure has a sound physiological basis.

2. While the procedure gives more favorable results in angina pectoris, the results in congestive failure justify the operation in that condition also.

3. A case is reported of total thyroidectomy for congestive heart failure in which excellent results were obtained.

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EDITORIAL

IN TIMES OF STRESS

THIS is a period in our history as a nation when the great winds of change are blowing and we must each play a part in seeing that it is the chaff only which is carried away and that we retain the sound truths by which our form of society lives. The physician especially should by his training and his experience be fitted to comprehend that there are values which are permanently a part of the human organism and that any plan for society which contravenes these built-in beliefs of the human race can succeed only for the brief duration of a period of mass hysteria. Destructive as a hysterical nation may be and great as may appear its successes, if its principles of action contradict the instinctive faiths of man it is doomed to ultimate failure.

Hysteria is, however, a contagious phenomenon. A mass negation by an afflicted nation of the slowly developed code of social and international morality, if it leads to striking immediate successes, has a great influence on the stability of other nations. The weaker ones in each people begin to be uncertain of their own beliefs and to question whether perhaps indeed the very world has changed and the old truths, such as honor, tolerance, mercy and the equal rights of the weak and the strong, been swept away. A nation which seriously questions its own beliefs is in danger of not standing firm.

Our knowledge of man, and of man's reactions is perhaps as wide and is certainly more solidly founded than that of any other group in society. We have dealt with this psychosomatic entity long hours of the day and night since the time when on entering school we first took scalpel in hand to dissect the structures of the human body. We have explored not only man's construction but have learned and are constantly learning more of his functions. There we have found laid down intricate patterns of reflex and hormonal interactions, eons old, and plainly related to adaptation to a world environment. Not less certainly have we observed in the varied and recurring crises in man's affairs in which our assistance is implored, the constancy of man's fundamental mental patterns, his fears, his aspirations, his instinctive devotions.

The physician knows not only that the essential mechanisms of man's body are unchanging except in terms of many thousands of years but also that man's essential beliefs in what he terms good and what he feels to be evil in human relations have a similar unchangeable quality. Built in to the warp and woof of the human mind and body by endless cycles of group living these beliefs are as permanent in their way as are the mechanisms of respiration.

The actions of man and the actions of nations are readily swayed toward good or bad ends, and mob psychology may even persuade the individuals of

a mob that what they do is good, and silence for a time the deeper individual knowledge that the action is evil. But mob hysteria is a tempest of wind that stirs the surface waters now this way and now that and man's own knowledge of what is good and evil is more akin to the eternal motion of the tides and the flow of the rivers to the sea.

There are causes of conflicts between nations in which the right and the wrong are far from clear. There are perhaps none in which there is not some right to both sides. In the present conflict, however, we have pledged ourselves to oppose a nation which has made it plain that it acts against some of man's deepest instincts of what is good in human relations. This nation has adopted faithlessness and treachery, intolerance and cruelty as a working code. It proclaims that its might gives it the right to subjugate weaker peoples. It proposes a world reorganized on such principles.

How far this hysterical crusade of the German people will carry them in the immediate future depends to a great extent upon the concerted efforts of our own nation. The quality of our effort depends in turn upon how deeply we feel the rightness of our cause.

We physicians, who know that such an outburst of national hysteria can have no more effect on the ultimate form of human society than a gale would have on the ebb and flow of the tides, must nevertheless as practical men recognize its destructive possibilities to our nation, to the people of our own generation and to their children. In this period in which all things are questioned we may from our knowledge and experience affirm the validity and the ageless character of man's perception of plain right and wrong in human affairs. We may each serve as a firm mooring post for those weak vessels that might otherwise drift with the wind.

M. C. PINCOFFS

REVIEWS

Night Nursing. By CATHERINE E. REILLY, R. N., Night Supervisor, Chester County Hospital, West Chester, Pa. 154 pages; 15 × 23 cm. F. A. Davis Company, Philadelphia. 1940. Price, $2.00.

This book is one of the very few works on night nursing as a special field. It is attractively bound, and the subject matter is accurate and concise. The sound philosophy which runs through its pages is particularly appealing, and warrants its serious consideration not only as a collateral reading textbook for training schools, but also as a book to be read profitably by parents of those already in training and those considering entering a training school for nurses.

The technical suggestions are practical. Even an experienced clinician can gain much from the perusal of its pages, for it gives an intelligent insight into the problems which continually confront The Lady with the Flashlight.

H. P., Jr.

Handbook of Skin Diseases: A Practical Guide to Diagnosis and Treatment. By LEON H. WARREN. 321 pages; 13 × 19 cm. Paul B. Hoeber, Inc., New York, N. Y. 1940. Price, $3.50.

"The Handbook of Skin Diseases" is unusual in a number of respects. It completely lacks illustrations and the descriptions of the morphology of lesions are minimal. The clinical and pathological features of skin lesions are outlined briefly and therapy is scantily discussed. For these reasons it is not recommended as a teaching text.

It contains, however, certain admirable features. The chapter on the "General Principles of Therapy" is very helpful. The alphabetical listing of the diseases is useful to the trained practitioner who desires a quick short reference to a special dermatosis. The interpretation of the etymology of the names of skin diseases is very interesting.

F. A. E.

The Neuroses in War. By several authors, edited by EMANUAL MILLER. 250 pages; 14 × 21 cm. The Macmillan Co., New York. 1940. Price, $2.50.

This book, the product of British psychiatrists, most of whom had military experience during the last World War, is very timely and should prove to be of real value to medical men who are now interested in problems of military medicine. The authors show clearly why Selective Service authorities are anxious to keep out of the U. S. Army men who are psychoneurotic, psychopathic or emotionally unstable. Such men in active service do much to disrupt morale, and after service account for a large proportion of the expense of pensions.

The first chapter constitutes an excellent survey of the literature of neuroses in war. It covers the many official and non-official books and articles that came out of the last war, British, American, French and German.

The next four chapters describe the war time conditions under which neuroses occur, and the types most commonly seen at advance posts as well as in base hospitals. Two of the authors had opportunities to observe psychiatric cases in medical as well as surgical services. Two separate studies showed that 75 per cent of the cases on medical wards of base hospitals were primarily functional. Discussing "effort syndrome" as the commonest functional cardiac type, the authors state, "It will do irreparable harm to the effort syndrome patient if he is evacuated, under a cardiological label, to a general hospital; for, to quote the American Medical History of the 1914–18 war, 'the general hospital is the culture medium of the effort syndrome.'"

There are three chapters on treatment, stressing particularly methods applicable to conditions of active service. The authors point out the experience of nearly every one that functional cases seen and recognized early are relatively easy to treat and respond in a gratifying manner to prompt and vigorous psychotherapy. A large proportion of such cases, treated near the field of action, can be sent back to active service without being evacuated. However, the large number of functional cases that are not recognized, and are sent back to base hospitals, somehow become chronic and very resistant to any form of therapy.

The tone of the book is practical, the theories are conservative and sound, and the language is refreshingly free from the " jargon " of any school of thought. One chapter deals with psychiatric organization in the services. One chapter discusses the psychology of civilian morale and the " war of nerves." The book ends with a chapter written by H. Crichton-Miller, in which he summarizes the main findings and conclusions.

H. W. N.

Strange Malady; The Story of Allergy. By WARREN T. VAUGHN, M.D. 268 pages; 15 × 22 cm. Doubleday, Doran and Company, Inc., New York. 1941. Price, $3.00.

The book is written in an interesting, nontechnical manner with the aid of cartoons to illustrate principles and theories of allergy.

It presents a very short history of medicine and a more detailed history of allergy and immunity. It deals with the many manifestations of allergy and much space is given to amusing and troublesome problems encountered. Mention is made of the great variety of allergens and some of the difficulties involved in their detection. Due consideration is given to emotional influences and conditioned reflexes in the initiation of symptoms in allergic disorders.

The general principles of treatment are given. The importance of the observance of fundamental rules is impressed on the reader by the review of alarming and also fatal accidents which have occurred on the basis of hypersensitivity. However, the book tends to develop an attitude of optimism toward the present state and the future of the study of allergy.

The book will be of interest and aid to the patient who has an allergic disease or to one who has a history of allergy in his family.

S. E. M.

Diseases of the Digestive System. By EUGENE ROSENTHAL, M.D., and R. J. V. PULVERTAFT, M.D. 394 pages; 18 × 25 cm. C. V. Mosby Co., St. Louis. 1940. Price, $8.50.

The need for a comprehensive volume dealing with gastroenterology has been well met by " Diseases of the Digestive System." The authors have been able to assemble the fundamental information necessary for an understanding of the subject, without overburdening the reader with unessentials or references to controversial points. Although intended primarily for medical students, the book provides a reference work well adapted to the needs of the practitioner or even the specialist in the field.

By using numerous analytical diagrams and colored charts, the writers have evolved a system of teaching that is refreshing and quite valuable in effecting its purpose. Although Dr. Rosenthal writes from continental Europe, the point of view throughout his text is in harmony with the teachings of this country.

Here is a book that takes the straight path in a field in which the uninitiated can be easily misdirected. It is well recommended for supplementary reading in gastroenterology.

F. G. D.

ROGER I. LEE
PRESIDENT, AMERICAN COLLEGE OF PHYSICIANS, 1941–1942

COLLEGE NEWS NOTES

The 25th Annual Session of the College, held in Boston, April 21–25, 1941, produced the largest gross attendance of any Meeting in the College history—although the New York Session in 1938 produced the largest member attendance. Physicians were present from forty-six states and the District of Columbia (Nevada and New Mexico were not represented), from Puerto Rico, from seven provinces of Canada, from Panama, China, Cuba, Mexico, and from Chile and Colombia of South America. The following is a comparative summary of the registration for the past four years:

		Members	Guest Physicians	Guest Non-Physicians	Students	Exhibitors	Ladies	Total
Boston	(1941)	1364	556	33	129	230	469	2781
Cleveland	(1940)	1221	710	25	116	223	262	2557
New Orleans	(1939)	896	525	16	499	167	578	2681
New York	(1938)	1447	463	24	3	291	319	2547

The gross attendance from the leading states was as follows:

Massachusetts	805	Ohio	103	Indiana	49
New York	408	Connecticut	87	Maryland	49
Pennsylvania	244	New Jersey	75	California	46
Michigan	111	Illinois	62	Rhode Island	46
		Canada	53		

It was observed that those states which hold regional meetings produced the largest percentage of member attendance.

The number in attendance frequently taxed the capacities of the ballroom and other meeting places. A new feature in entertainment was a concert by the Boston Symphony Orchestra under the direction of Dr. Serge Koussevitzky, complimentary to the College members. This nationally famous orchestra and its talented conductor gave a concert deeply appreciated, as evidenced by the attendance of more than 2500 physicians and their guests. A beautifully executed testimonial signed by the President and Secretary General was presented to Dr. Koussevitzky in appreciation of his concert and in recognition of his talents, the testimonial reading:

"AMERICAN COLLEGE OF PHYSICIANS

to

SERGE KOUSSEVITZKY

By thy art, thou callest forth concourses of sweet sounds to succor those whose life's aim is to comfort and to cure, and so do we, humble disciples of the healing art, acclaim thee as Master Healer of us all."

The Convocation on Wednesday evening, April 23, was attended by a capacity audience. The Presidential Address by Dr. James D. Bruce and the Convocational Oration by Dr. James Alex. Miller, both dealing with the primary interests and activities of the College, were received with enthusiasm and will be published in this
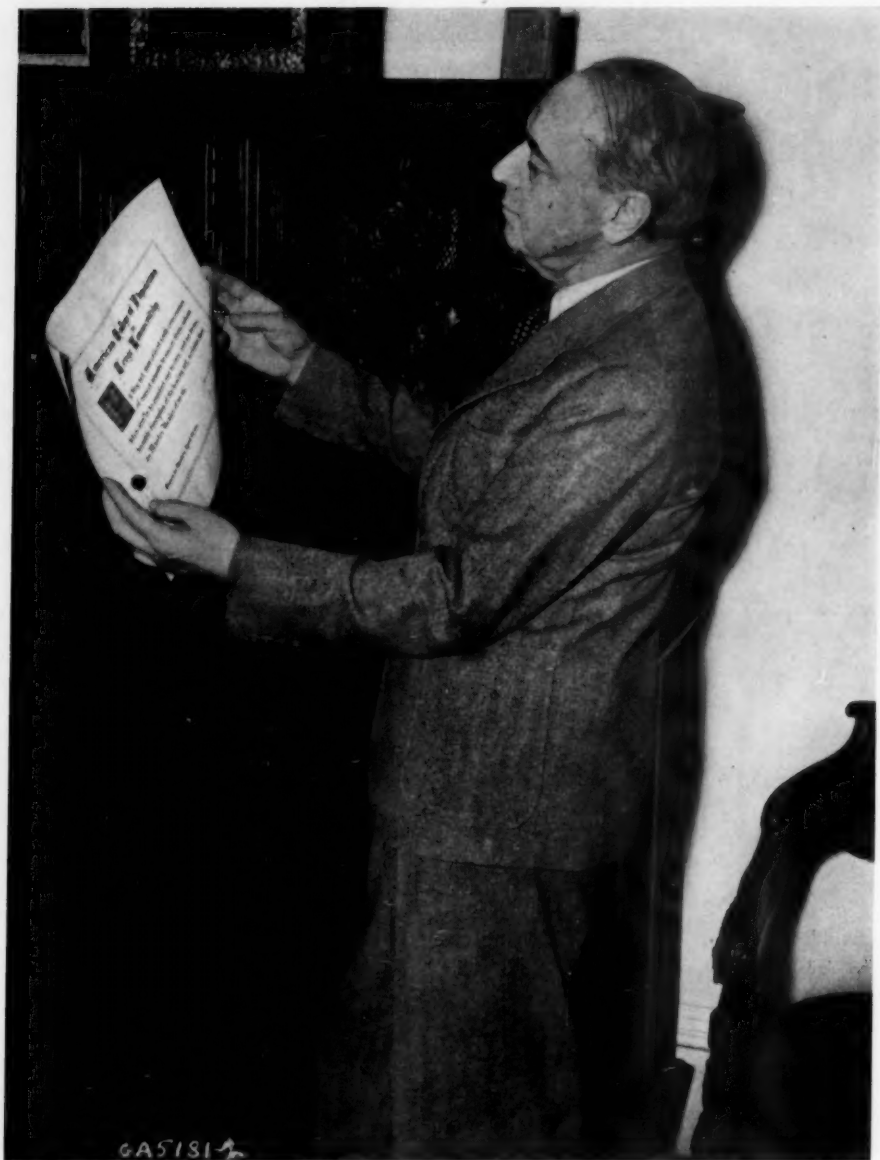
FIG. 1. Dr. Serge Koussevitzky, reading College testimonial.

journal. Fellowships were conferred upon 306 * physicians who had qualified during
the past year, and Dr. James Alex. Miller, the Convocation orator and former Presi-
dent of the College, received the only Mastership conferred this year. Masters of the
College are those who have already attained the rank of Fellows and who, on account
of personal character, positions of influence and honor, eminence in practice or in
medical research, or other attainments in science or in the art of medicine, are recom-
mended by the Committee on Credentials to the Board of Regents for special and well-
earned distinction. Dr. Miller, in addition to having been one of the past Presidents
of the College, is Professor of Clinical Medicine at Columbia University College of
Physicians and Surgeons; former President of the New York Academy of Medicine;
a Diplomate of the American Board of Internal Medicine; Consulting Physician to
the Trudeau Sanatorium, Presbyterian, Bellevue and Methodist Hospitals, and the New
York Post-Graduate Medical School and Hospital. He has served the College many
years in many important capacities, including Chairman of the Executive Committee;
Chairman of the Finance Committee; Chairman of the Committee on Survey and
Future Policy; and General Chairman of the New York Annual Session in 1938.
During his Presidency the final draft of the application for the formation of the
American Board of Internal Medicine was submitted to the Advisory Board of Medi-
cal Specialties, and it was through his initiative while President of the College that the
original plans were executed for the acquisition of a permanent College home.

The Annual Banquet of the College on Thursday evening, April 24, was also
attended by a capacity group. Dr. Earnest Albert Hooton, Professor of Anthro-
pology at Harvard University, gave an amusing and thought-provoking address on
" Hip-Hip-Hippocrates, or An Anthropological Cheer for Medicine." Dr. William
B. Breed was Toastmaster and in his inimitable manner was, to say the least, a

* GEOGRAPHICAL DISTRIBUTION OF NEWLY-ELECTED FELLOWS, 1940-41

Alabama	3	Oregon	2
Arizona	1	Pennsylvania	32
Arkansas	1	Rhode Island	1
California	10	South Carolina	2
Colorado	5	Tennessee	4
Connecticut	7	Texas	10
Delaware	2	Utah	2
District of Columbia	6	Vermont	1
Florida	4	Virginia	5
Georgia	6	Washington	5
Idaho	1	West Virginia	4
Illinois	9	Wisconsin	1
Indiana	6	Wyoming	1
Iowa	1	Medical Corps, U. S. A.	10
Kansas	1	Medical Corps, U. S. N.	4
Kentucky	4	U. S. Public Health Service	3
Louisiana	7	Puerto Rico	4
Maine	1	Dominion of Canada:	
Maryland	2	Alberta 1	
Massachusetts	13	British Columbia 1	
Michigan	10	Ontario 1	
Minnesota	6	Nova Scotia 1	
Missouri	6	New Brunswick 1	
Montana	1	Saskatchewan 1	6
Nebraska	3		—
Nevada	1	Brought Forward	292
New Hampshire	1	Bahamas	1
New Jersey	2	Cuba	12
New York	62	Turkey	1
North Carolina	5		—
Ohio	6		306
Oklahoma	2		

"howling" success. The Surgeon General of the U. S. Army, Major General James C. Magee, was introduced and made a brief address, as did also the retiring President, Dr. James D. Bruce, Ann Arbor, the newly inducted President, Dr. Roger I. Lee, Boston, and the President-Elect, Dr. James E. Paullin, Atlanta.

The program of entertainment for visiting women was a most attractive one, with a local committee working at all times for the pleasure and comfort of the visiting wives and families. It had been estimated that there would be only three hundred guests to be entertained by the Ladies Committee, but there were actually four hundred and sixty-nine. Although the increased number made some strain upon the original budget and facilities, the local committee handled the entire program and arrangements most successfully and to the satisfaction of all.

Post-Meeting reports on the program all indicated a deep appreciation and high regard for the General Sessions, Morning Lectures, Panel Discussions and Clinics. The ballroom of the Hotel Statler frequently was filled beyond seating capacity for the General Sessions. The Panel Discussions were all well attended and many of the room capacities were exhausted. Especially favorable comments were heard concerning all of the Clinics, due particularly to the local committee arranging a program of real clinics where patients were shown.

The 1941 Annual Business Meeting

The General Business Meeting, held in conjunction with the 25th Annual Session of the American College of Physicians, convened in the Hotel Statler Ballroom, Thursday, April 24, 1941, at 5:30 p.m., with President Bruce presiding and Mr. E. R. Loveland acting as Secretary. The Secretary read abstracted minutes of the preceding Annual Business Meeting, which were approved as read.

Dr. William D. Stroud, Treasurer, presented the following report:

"Mr. President and Members: The finances of the American College of Physicians, as usual, are under the general supervision of its Board of Regents, and more especially supervised by the Committee on Finance. The accounts are recorded in the Executive Offices, according to accepted accounting principles, and audited by a certified public accountant.

"The 1940 operations of the College indicate a satisfactory financial situation. Through growth and life membership subscriptions and a transfer of $25,000.00 by the Board of Regents from the General Fund to the Endowment Fund, the Endowment Fund, on December 3, 1940, amounted to $126,346.22. The General Fund amounted to $146,922.48. Therefore, the total assets (book value) of the College are $273,268.70. The net increase in capital for both funds for the past year was $27,-315.51. Our investments have paid a little over 4 per cent. A full, detailed financial statement will be published in an early issue of the ANNALS OF INTERNAL MEDICINE for the information of all members.

"Upon recommendation of the Finance Committee and the subsequent approval of the Board of Regents, the Budget for 1941 has been adopted, calling for an estimated income of $113,800.00 and an estimated expenditure of $100,644.00. Respectfully submitted by William D. Stroud, Treasurer."

Mr. E. R. Loveland, Executive Secretary, presented the following report:

"The Executive Secretary's report is supplementary to the reports of the Treasurer and the Secretary-General. Much that has happened in the College, has also been covered in the annual address of the President.

"The past year again has been characterized by a definite increase in the activities of the College and in the duties of the Executive Offices, but at the same time our work has been rendered more interesting by its diversity and the coöperation and

kindly aid of the Officers, Regents and the Governors. The Secretary-General will give you a report on the College membership. I would like to pay tribute especially to the Committee on Credentials which makes a tremendous contribution to this College in time and in most careful work. When you hear the number of candidates elected, you should remember that the credentials of a much greater number have been submitted and reviewed. Credit should be distinctly given to all of the College Committees and to the College Boards. They are always present at our meetings and I have never in my experience known any group so interested and so attentive to their responsibilities. You have been fortunate in the selection of these men.

"During the past year your Editor has expanded the ANNALS OF INTERNAL MEDICINE by more than 300 pages over the preceding year. Much of the College literature, especially that referring to the requirements for admission, has been revised and republished. A supplement to the College Directory was issued and a new Directory, fully revised, will be published this coming summer. The long worked upon History of the College was completed and distributed this past year to the entire membership. At least a score of meetings have been conducted by the College Governors for their particular regions, as a result of which there has been an increased participation by our members in College affairs. These meetings contribute greatly to a better understanding of the objectives and activities of your organization. The Regents and the Governors individually have exhibited at all times a keen interest in and an effort to advance the College. The work of preparing for this Meeting, which bids fair to be one of the largest, if not the largest in the College history, has been lightened by the ready assistance and coöperation of President Bruce, General Chairman Breed and his efficient local committees. The registration to this time totals 2,781, of whom 469 are visiting women. While these are not all members of the College, the great majority are. We have studied the attendance records of several other national medical societies and we have found not one whose percentage of member attendance approaches the record of the College.

"We are gratified with the increasing number who have visited us at our Headquarters in Philadelphia, and we wish again to extend a most cordial welcome to our members and to express a desire to be of increasing service to them in the coming year. Respectfully submitted by E. R. Loveland, Executive Secretary."

Dr. George Morris Piersol, Secretary-General, presented the following report:

"*Membership*—Since the last Annual Session of the College we have lost by death 47 Fellows, 7 Associates, or a total of 54; by resignation, 2 Fellows, 3 Associates, total, 5; by failure to take up election, 1 Associate; by failure to qualify for advancement to Fellowship within the maximum five-year period prescribed by the By-Laws, 14 Associates; by delinquency, 4 Fellows and 1 Associate. Your attention is directed especially to the very small number of members who have failed to keep in good standing out of a membership so large as ours. The total membership mortality for the past year, therefore, has been 53 Fellows and 24 Associates; total, 77. There have been elected to Fellowship 306 physicians, only a few of whom were elected directly to Fellowship because of special qualifications and outstanding accomplishments. There have been elected to Associateship 273; 1 Fellow has been reinstated and 1 Fellow has been elevated to Mastership. The total membership of the College as now constituted is as follows:

<div align="center">

4 Masters
3,371 Fellows
1,220 Associates
—————
4,595 TOTAL

</div>

"*Life Membership*—31 Fellows have become Life Members during the past year, making a grand total of 167, of whom 16 are deceased, leaving 151 on the roll at this time.

"One year ago a regulation was adopted providing that all candidates elected thereafter, when coming up for advancement to Fellowship, shall present satisfactory evidence of certification by their national board of certification where such a board exists, this rule, however, not applying to candidates from the Army, Navy and Public Health Service, nor to Associates elected prior to April 6, 1940.

"The Committee on Postgraduate Education, with the whole-hearted coöperation of the Governors and many of our Fellows, extended the program of intensive postgraduate courses this past year. Whereas for the year previous there were but five such courses given, this year there were eight, two of which were given during February and six of which were given just preceding the opening of this Session. The courses given were as follows:

Allergy at the Roosevelt Hospital, New York City;
Gastrointestinal Diseases at the Mayo Foundation, Rochester;
General Medicine at Harvard Medical School, Boston;
Allergy at the Massachusetts General Hospital, Boston;
Gastro-enterology at the Boston University School of Medicine;
General Medicine at the University of Michigan Medical School, Ann Arbor;
Clinical Medicine from the Hematologic Viewpoint at Ohio State University College
    of Medicine, Columbus;
Cardiovascular Diseases at the University of Pennsylvania, Philadelphia.

The course in General Medicine at Harvard University was for a period of three weeks; the other courses were given for periods of one to two weeks.

"Three additional Research Fellowships have been voted by the College this year, these fellowships to go into effect on July 1, next."

The Secretary-General, Dr. Piersol, proceeded:

"And now, Dr. Bruce, during the past year, while you so ably and so wisely guarded the destinies of this College, you have become more than ever endeared to all of us, who have had the privilege of working with you. We are deeply appreciative of the never-failing spirit of coöperation and courtesy which you have shown in your work with the College.

"Therefore, on behalf of the Officers, Regents, Governors of the American College of Physicians, I have the honor to present to you this gavel as an enduring symbol of the high office you have occupied, as well as a token of our affection and esteem." (Applause)

President Bruce: "Thank you very much; I am very deeply grateful to you. It seems scarcely possible that a year has passed since Dr. O. H. Perry Pepper at the Cleveland Session passed on to me the honor of the Presidency of this College. I was deeply impressed and grateful for the honor, but this was almost, if not quite, overshadowed by my sense of responsibility when I thought of those figures in American Medicine in whose footsteps I was about to follow.

"However, when I realized that all of our Officers and members stood ready at all times to meet requests for advice and assistance, I soon came to feel a greater sense of confidence. This is as it should be in a truly democratic organization such as ours, and so the year has passed happily for me, and uneventfully for the College.

"Although this country is now facing a decision, probably the most momentous in our own as well as in world history, it is related that when General Wolfe was with a small flotilla of boats and was slipping by the Fortress of Quebec seeking a landing,

he recited to his officers Gray's 'Elegy Written in a Country Churchyard.' In the silence which followed, he turned to his officers and said: 'Gentlemen, I would sooner be the author of this book than to take Quebec.'

"This is the way I feel about the honor you have bestowed upon me. I would rather have been your choice for President than the recipient of any other honor of which you or I can think.

"In completing my term of office as your President and returning to the ranks, it will be with an ever greater and increasing interest in the onward march of the College."

Dr. Roger I. Lee, President-Elect of the College, was then introduced by retiring President Bruce and inducted to office amid applause.

PRESIDENT LEE: "President Bruce—because he is still really President—Fellows of the American College of Physicians, I know the hour is late, but I would be less than human if I did not venture to express to you my thanks at the great honor which you have passed on to me. It is, I think, the greatest honor that could come to any man to be recognized as a leader for a year of his chosen profession and of his specialty within that profession, and to the College I promise the devotion of whatever talents I may have, and furthermore, under what leadership I may have, I promise the active, aggressive support of the College to those causes of freedom, democracy and safety of our whole continent of America." (Applause)

President Lee called for a report of the Committee on Nominations. In the absence of its Chairman, Dr. David P. Barr, the following report of the Committee was presented by Dr. Charles F. Tenney, Committee member:

" A—For the Elective Offices:

                    President-Elect ....James E. Paullin, Atlanta, Ga.
                    First Vice President ....D. Sclater Lewis, Montreal, Que.
                    Second Vice President ....Thomas T. Holt, Wichita, Kan.
                    Third Vice President ....Samuel E. Munson, Springfield, Ill.

(The list of nominees has been published in accordance with the directions of the By-Laws in the February Issue of the ANNALS OF INTERNAL MEDICINE.)

" B—For the Board of Regents:

Term Expiring 1944

Hugh J. Morgan, Nashville, Tenn.
Ernest E. Irons, Chicago, Ill.
T. Homer Coffen, Portland, Ore.
Jonathan C. Meakins, Montreal, Que.
James D. Bruce, Ann Arbor, Mich.

" C—For the Board of Governors:

Term Expiring 1942

Lawrence Parsons, Reno ....NEVADA *

Term Expiring 1943

Charles Henry Sprague, Boise ....IDAHO *

* New Territories that have now qualified to have Governors.

Term Expiring 1944

Roy E. Thomas, Los Angeles ....California (Southern)
James J. Waring, Denver ....Colorado
Charles H. Turkington, Litchfield ......Connecticut
Wallace M. Yater, Washington ....District of Columbia
Cecil McKee Jack, Decatur ....Illinois (Southern)
Robert M. Moore, Indianapolis ....Indiana
Harold H. Jones, Winfield ....Kansas
William B. Breed, Boston ....Massachusetts
Warren Thompson, Omaha ....Nebraska
Nelson G. Russell, Sr., Buffalo ....New York (Western)
Leander A. Riely, Oklahoma City ......Oklahoma
Edward L. Bortz, Philadelphia ....Pennsylvania (Eastern)
R. R. Snowden, Pittsburgh ....Pennsylvania (Western)
John L. Calene, Aberdeen ....South Dakota
William C. Chaney, Memphis ....Tennessee
Louis E. Viko, Salt Lake City ....Utah
Harry L. Arnold, Honolulu ....Hawaii
Warren Soper Lyman, Ottawa ....Ontario
Francisco de P. Miranda, Mexico City ..Mexico *
Lawrence Getz, Ancon ....Republic of Panama and the
                                 Canal Zone

Respectfully submitted,

Reginald Fitz
Fred M. Smith
Charles F. Tenney
Ernest B. Bradley
David P. Barr, Chairman
           Committee on Nominations "

Each section was acted upon separately and President Lee in each instance asked for nominations from the floor, if there were any to be made. In due course and according to parliamentary rule, each nominee presented by the Committee on Nominations was officially elected to office. President Lee appointed a committee of two to conduct the President-Elect to the platform.

President-Elect Paullin made a brief address and pledged himself to the best of his ability to carry out the traditions of the College in the future.

President Lee then read a letter of appreciation from Dr. Serge Koussevitzky, Conductor of the Boston Symphony Orchestra, for the honor and the testimonial that had been issued to him by the College.

Dr. Wallace M. Yater presented the following resolution:

" Be It Resolved: That the cordial and sincere thanks of the entire membership of the American College of Physicians be extended to our retiring President, Dr. James D. Bruce, to the General Chairman, Dr. William B. Breed, to the new President, Dr. Roger I. Lee, to the Chairman and members of the Boston Committees, individually and collectively, to Mrs. Donald S. King and her most courteous and efficient Committee on Ladies' Entertainment for their faithful and superior work in the conduct of this memorable Session, and

* New territories that have now qualified to have Governors.

" BE IT FURTHER RESOLVED: That our appreciation be extended, also, to those co-operating agencies and medical schools, the hospitals, the Public Press, the Boston Symphony Orchestra and its Conductor, Serge Koussevitzky, the Boston Convention Bureau, and the Management and Staff of the Hotel Statler and the Copley Plaza for their coöperation and help, all of which has contributed so much to our entertainment, pleasure and comfort."

The motion was duly seconded and there was a chorus of " ayes " for its unanimous adoption. President Lee asked the General Chairman, Dr. William B. Breed, to stand, whereupon he received the ovation of the entire audience.

Adjournment.

THE POST-CONVENTION TOUR TO PLYMOUTH AND CAPE COD

Following the close of the 25th Annual Session of the College at Boston, a Post-Convention Tour was conducted to Plymouth, Cape Cod, and the Pilgrim Shore. The following were members of the party: Dr. and Mrs. George E. Baker, Casper, Wyo.; Dr. and Mrs. Clarence C. Campman, West Middlesex, Pa.; Dr. Tomás G. Guardia, Panama, R. P.; Dr. and Mrs. Ernest D. Hitchcock, Great Falls, Mont.; Dr. and Mrs. Earl L. Mills, Wichita, Kan.; Dr. and Mrs. Samuel G. Plice, Chicago, Ill.; Dr. and Mrs. William S. Reveno, Detroit, Mich.; Dr. Vernon C. Rowland, Cleveland, Ohio; Dr. and Mrs. Albert A. Schultz, Fort Dodge, Iowa; Miss Dorothy Smith, Omaha, Nebr.; Dr. and Mrs. James C. Stewart, Topeka, Kan.; Dr. and Mrs. George F. Stoney, Erie, Pa.; Dr. and Mrs. Warren Thompson, Omaha, Nebr.; Master Tommy Thompson, Omaha, Nebr.; Dr. and Mrs. William A. Lange, Brooklyn, N. Y.; Dr. and Mrs. Robert M. Purdie, Houston, Tex.; Dr. and Mrs. Philip W. Morgan, Emporia, Kan.; Dr. Edwin B. Jarrett, Baltimore, Md.

The group left Boston immediately following the close of the Annual Session on Friday, April 25, and visited Plymouth, Pilgrim Hall, Burial Hill, Plymouth Rock; traversed Cape Cod both by the North and South Shores; Duxbury, John Alden House; Home of Daniel Webster; Old Oaken Bucket House; and Adams Mansion. Unfortunately, the weather was unfavorable for maximum enjoyment, but the tour was reported as a successful and enjoyable event.

THE BOSTON TECHNICAL EXHIBIT

There were seventy-two individual exhibitors occupying a total of eighty-six Exhibit Booths. An interesting and attractive guide to the exhibits and to the products on display was issued to every physician. While the Exhibit was distributed widely because of physical facilities, the individual exhibits were carefully planned and attractively set up. The Exhibit was restricted to the field of internal medicine and its allied specialties, and was acclaimed to be one of the most valuable and most interesting technical medical exhibits ever sponsored by the College or any other medical society. The reports of the exhibitors were almost unanimously enthusiastic, which indicates general appreciation and interest on the part of our attending physicians in relation to exhibits when they are presented on a high scale.

ELECTIONS TO MEMBERSHIP, BOSTON, APRIL 20, 1941

Fellows

Aballi y Arellano, Angel Arturo, Havana, Cuba
Acton, Conrad, Baltimore, Md. ([MC], U. S. Army)

Alexander, Harry Allison, Boulder, Colo.
Andes, Jerome Eli, Tucson, Ariz.
Antonetti, Alfredo, Havana, Cuba
Armstrong, Harry George, (MC), U. S. Army
Averbuck, Samuel Harris, New York, N. Y.

Badger, Theodore Learnard, Boston, Mass.
Bailey, Frederick Randolph, New York, N. Y.
Baker, George Erwin, Casper, Wyo.
Beatty, Gerald Aloysius, Wilmington, Del.
Beck, Frederick, Ithaca, N. Y.
Bell, Joseph Clark, Louisville, Ky.
Bethea, James McRae, Memphis, Tenn.
Billings, Edward Gregory, Denver, Colo.
Bisbé y Alberni, José, Havana, Cuba
Blackford, Staige Davis, Charlottesville, Va.
Bond, George Samuel, Indianapolis, Ind.
Bower, Albert Gordon, Glendale, Calif.
Boyd, Douglas, Highland Park, Ill.
Brimmer, Karl Walter, Washington, D. C.
Brown, Daniel Noyes, New York, N. Y.
Bruenn, Howard Gerald, New York, N. Y.
Buie, Neil Dugald, Marlin, Tex.
Bullowa, Jesse Godfrey Moritz, New York, N. Y.
Burkhardt, Edward Arnold, New York, N. Y.
Burtness, Hildahl Ingbert, Santa Barbara, Calif.

Cantor, Maxwell Mordcai, Edmonton, Alta., Can.
Cardenás y Pupo, Carlos F., Havana, Cuba
Centurión, José J., Havana, Cuba
Chafee, Francis Hasseltine, Providence, R. I.
Chamberlain, Olin Burnham, Charleston, S. C.
Chesley, Faris Franklin, Chicago, Ill.
Cloyd, Augustus David, Omaha, Nebr.
Cole, Llewellyn Rathbun, Madison, Wis.
Connell, Walter Ford, Kingston, Ont., Can.
Cruikshank, John Merrill, Nassau, Bahamas
Curtis, John Kimberly, New York, N. Y.

Dameshek, William, Boston, Mass.
Daughton, Alva Duckett, Washington, D. C.
Davis, Aubrey Milton, Portland, Ore.
Dewey, Albert Warner, Gaziantep, Turkey
Dibble, John, (MC), U. S. Army
Dominguez, Cesar, Humacao, P. R.
Douglas, Albert Harris, Jamaica, L. I., N. Y.
Dozzi, Daniel Louis, Philadelphia, Pa.
Druet, Kenneth Lewis, Salina, Kan.
Dry, Thomas Jan, Rochester, Minn.
Duerfeldt, Treacy Henry, Tacoma, Wash.
Durham, Robert Brannan, Atlantic City, N. J.

Epstein, Harry H., Jamaica, L. I., N. Y.

Fariñas Mayo, Pedro Leandro, Havana, Cuba
Ferguson, Arthur Newton, Fort Wayne, Ind.
Ferree, John Willard, Indianapolis, Ind.
Findley, Thomas Palmer, Jr., St. Louis, Mo.
Finnegan, Francis Roman, St. Louis, Mo.
Friedberg, Charles Kaye, New York, N. Y.
Fulton, Marshall Nairne, Brookline, Mass.

Gay, Leslie Newton, Baltimore, Md.
Gillespie, James Ogilvie, (MC), U. S. Army
Golz, Harold Habich, Clarksburg, W. Va.
Green, Mack Macon, (MC), U. S. Army
Greenspan, Edward Bertram, New York, N. Y.
Gydesen, Carl Sophus, Colorado Springs, Colo.

Hamilton, Ian Bruce, Canton, Ohio
Hammonds, Everett England, Birmingham, Mich.
Harris, Robert Miller, Miami, Fla.
Herrell, Wallace Edgar, Rochester, Minn.
Hess, Charles Leonard, Bay City, Mich.
Hobson, Samuel, New Orleans, La.
Hogan, Bartholomew William, (MC), U. S. Navy
Holland, Harry Albert, Philadelphia, Pa.
Hollis, Ben Harvey, Louisville, Ky.
Holly, Leland E., Muskegon, Mich.
Hurst, Arthur Trimble, Louisville, Ky.
Hurtado, G., Felix, Havana, Cuba
Hussey, Hugh Hudson, Jr., Washington, D. C.
Hutton, John Evans, New York, N. Y.

Keeton, Robert Wood, Chicago, Ill.
Kelchner, Clyde Hartzell, Allentown, Pa.
Kelley, William Henry, Charleston, S. C.
Kendall, Charles Benjamin, (MC), U. S. Army
King, Frederick Herbert, New York, N. Y.
Kitchell, James Roderick, Philadelphia, Pa.
Knies, Phillip T., Columbus, Ohio
Kopecky, Leon Charles, San Antonio, Tex.

Labensky, Alfred, New London, Conn.
Landron Becerra, Jose, Santurce, San Juan, P. R.
Leiser, Rudolf, Eloise, Mich.
Lewis, Benton Oliver, U. S. Public Health Service
Lichtman, Solomon Sydney, New York, N. Y.
Lincoln, Miriam, Seattle, Wash.
Little, Joe Hollis, Mobile, Ala.
Livingston, Philip Henry, Chattanooga, Tenn.
Longfellow, Don, (MC), U. S. Army
Love, Julian, (MC), U. S. Navy
Lowance, Mason Ira, Atlanta, Ga.

Machle, Willard, Cincinnati, Ohio
Martin, Kirby Armstrong, New York, N. Y.

Mathers, Fred, Orlando, Fla.
McDaniel, Walter Shaw, Houston, Tex.
Mellen, Hyman Samuel, Detroit, Mich.
Meredith, William Cowan, New Rochelle, N. Y.
Metts, James Clayton, Savannah, Ga.
Mewborne, Edward Bruce, Newport News, Va.
Montoro Saladrigas, Octavio, Havana, Cuba
Moolten, Sylvan Elkan, New York, N. Y.
Moore, Ferrall Harmon, Palo Alto, Calif.
Muñiz, Jorge R., Havana, Cuba
Murphy, Alvin Edwin, St. George, S. I., N. Y.
Murphy, John Moylan, Detroit, Mich.

Nealon, Stephen William, Jr., Washington, D. C.
Nickum, John Stanley, Bridgeport, Conn.
Noyes, Edward A., (MC), U. S. Army

Ortega y Bolaño, Luis, Havana, Cuba
Ortiz y Ortiz, Antonio Maria, Santurce, San Juan, P. R.

Palmer, Harold Dean, Philadelphia, Pa.
Park, Felix Roman, Bala-Cynwyd, Pa.
Parker, Hubert McKibban, Kansas City, Mo.
Pawling, Jesse Randolph, Watertown, N. Y.
Petry, Howard Kistler, Harrisburg, Pa.
Poindexter, Samuel Marshall, Boise, Idaho

Quinn, David Edman, Livermore, Calif.

Reading, Robert Alvord, Cleveland, Ohio
Redmond, Arthur Douglas, Ogdensburg, N. Y.
Revercomb, Paul Houston, Charleston, W. Va.
Richison, Earl, (MC), U. S. Navy
Riggins, H. McLeod, New York, N. Y.
Rigney, Lawrence Joseph, Wilmington, Del.
Rosenak, Bernard David, Indianapolis, Ind.
Rudesill, Cecil Logan, Indianapolis, Ind.
Russell, Theodore Burg, New York, N. Y.

Scott, William Mastin, Shreveport, La.
Sebrell, William Henry, Jr., U. S. Public Health Service
Shahon, Henry Israel, New York, N. Y.
Shanno, Ralph Leopold, Forty Fort, Pa.
Short, Charles Lyman, Boston, Mass.
Silver, Solomon, New York, N. Y.
Simpson, Sutherland Eric, Watertown, N. Y.
Skinner, John Wylie, Kirkland, Wash.
Steele, Charles William, Lewiston, Maine
Stites, John, Louisville, Ky.
Sugg, Eugene Sifax, U. S. Public Health Service

Taylor, Fletcher Brandon, Oakland, Calif.
Taylor, Gurney, New York, N. Y.
Thomas, John Warrick, Cleveland, Ohio
Thompson, Ivan, Ogden, Utah
Thompson, Ralph Mathew, (MC), U. S. Army
Trapp, Carl Edward, Newton Centre, Mass.
Turrentine, Kilby Pairo, Kinston, N. C.
Tyson, Terence Lloyd, New York, N. Y.

Viamonte, J. Manuel, Havana, Cuba
Vieta y Barahona, Angel, Havana, Cuba

Walker, Helen Gertrude, Buffalo, N. Y.
Walker, William Clarence, Salt Lake City, Utah
Wanstrom, Ruth Cecelia, Ann Arbor, Mich.
Weilbaecher, Joseph Oswald, Jr., New Orleans, La.
Wilder, Gordon Botkin, Anderson, Ind.
Woldman, Edward Elbert, Cleveland, Ohio
Wulp, George Adolph, Hartford, Conn.

Zaur, Israel Sidney, Bridgeport, Conn.
Ziskind, Joseph, New Orleans, La.

Associates

Adlersberg, David, New York, N. Y.
Agnor, Elbert Boogher, Atlanta, Ga.
Arnett, Samuel Cullen, Jr., Lubbock, Tex.
Ashman, Leon, Baltimore, Md.
Atkinson, Arthur John, Chicago, Ill.

Bayley, William E. G., La Crosse, Wis.
Beckwith, Julian Ruffin, Charlottesville, Va.
Bell, Robert Alexander, (MC), U. S. Navy
Benson, Otis Otto, Jr., (MC), U. S. Army
Bradford, Aubrey Le Verne, (MC), U. S. Army
Brown, Robert Whitcomb, Fort Steilacoom, Wash.
Bruton, Martin Francis, Berwyn, Ill.
Burgeson, Paul Arthur, Warsaw, N. Y.
Burt, Kenneth Lewis, Howell, Mich.

Carroll, Hubert Henry, (MC), U. S. Navy
Chaikin, Nathan Wolf, New York, N. Y.
Childs, Edward Patterson, New York, N. Y.
Coggin, Charles Benjamin, Los Angeles, Calif.
Combs, Stuart Richardson, Terre Haute, Ind.
Cooper, Ralph Ruehle, Ann Arbor, Mich.
Cummings, Hatch Whitfield, Jr., Houston, Tex.

Dickey, Francis George, Baltimore, Md.
Downs, Charles McCabe, (MC), U. S. Army

Driscoll, Robert Edwin, Chicago, Ill.
Durham, J. Richard, Wilmington, Del.

Edwards, Robert Allison, Houston, Tex.
Eisele, C. Wesley, Chicago, Ill.
Ensworth, Herbert Kleber, New York, N. Y.
Evans, Earl Foster, (MC), U. S. Navy

Ferris, Lucian Minor, Vicksburg, Miss.
Fitts, Ralph Lamar, Grand Rapids, Mich.
Flickinger, Donald Davis, (MC), U. S. Army
Flynn, John Molloy, Boston, Mass.
Foulger, Margaret P. H., Philadelphia, Pa.

Gais, Elmer Stewart, New York, N. Y.
George, William Smith, (MC), U. S. Army
Goldberg, Samuel James, Jr., New Haven, Conn.
Gormley, Cyrus Martin, Butler, N. J.
Graham, William Donald, (MC), U. S. Army
Greaves, Frederick Clarence, (MC), U. S. Navy
Green, Mervin Edward, Ann Arbor, Mich.
Gross, Harry, New York, N. Y.
Grow, John Benson, (MC), U. S. Army
Gundersen, Sven Martin, Hanover, N. H.

Hale, Virginia Anne, Norwich, Conn.
Hays, James F., (MC), U. S. Navy
Healey, Claire Eliza, Ann Arbor, Mich.
Heavner, Lyle Everett, Detroit, Mich.
Hitzig, William Maxwell, New York, N. Y.
Holman, Charles Nixon, Portland, Ore.
Hopkins, B. Smith, Jr., Urbana, Ill.
Howell, Llewelyn Pennant, Rochester, Minn.
Hyman, Charles, Atlantic City, N. J.

Jaleski, Thomas Clarence, New Rochelle, N. Y.
Johnston, Alexander Henry, Glen Cove, N. Y.
Jordan, James Patrick, Buffalo, N. Y.

Katz, Sydney Milton, Brooklyn, N. Y.
Keeney, Edmund Ludlow, Baltimore, Md.
Kellogg, Frederick, Long Beach, Calif.
Kenamore, Bruce Delozier, St. Louis, Mo.
Kimbrough, Robert Cooke, Jr., Ann Arbor, Mich.
King, Boyd G., Cleveland, Ohio
Kirkpatrick, Charles Lee, (MC), U. S. Army
Klein, Andrew John Valois, East Orange, N. J.
Kroon, Harry C., Syracuse, N. Y.
Kubin, Milford T., (MC), U. S. Army
Kuraner, Heinz, (MC), U. S. Army
Kwitny, Isadore Jacob, Indianapolis, Ind.

Lang, Frederick R., (MC), U. S. Navy
Lynch, George William, Boston, Mass.
Lyons, Richard Hugh, Ann Arbor, Mich.

Maxwell, Richard Wesley, St. Louis, Mo.
McGinn, Sylvester, Boston, Mass.
Miller, Harry Dudley, Jr., Shelbyville, Ind.
Morgan, William Palmer, Austin, Tex.

Nolan, James Edward, Washington, D. C.
Norcross, John Wells, Boston, Mass.

Ogden, Ralph Trafton, Hartford, Conn.
Ogle, Dan Clark, (MC), U. S. Army
Osborne, John Randolph, Middletown, N. Y.
Owen, Kenneth Angle, Akron, Ohio

Pedden, John Rockwell, Grand Rapids, Mich.
Poole, Everett Blanks, Greenville, S. C.
Pritchett, Clark Poston, Columbus, Ohio
Pruitt, Francis Willard, (MC), U. S. Army

Query, Richard Zimri, Jr., Charlotte, N. C.

Rainey, John Faulkner, Anderson, S. C.
Rastetter, Joseph Walter, Milwaukee, Wis.
Rauschkolb, John Edward, Cleveland, Ohio
Ravid, Jacob Mordecai, Brooklyn, N. Y.
Reymont, Anthony Edward, Santa Fe, N. M.
Reynolds, Stephen, Ann Arbor, Mich.
Ricen, Edgar Moses, (MC), U. S. Navy
Richards, Richard Kohn, North Chicago, Ill.
Robishaw, Ruth Alice, Cleveland, Ohio
Rom, Jack, Detroit, Mich.
Rosenstiel, Henry Carl, Freeport, Ill.
Rosenthal, Phillip Jacob, Pittsburgh, Pa.

St. John, Clement Franklin, (MC), U. S. Army
Schneider, Ralph Frederick, New York, N. Y.
Schneierson, S. Stanley, New York, N. Y.
Schwartz, William Spencer, Trudeau, N. Y.
Scott, Augustine Thornton, Lexington, Ky.
Segal, Maurice Sidny, Boston, Mass.
Senerchia, Fred Ferdinand, Jr., Elizabeth, N. J.
Serra, Lawrence Mario, Baltimore, Md.
Slater, Solomon R., Brooklyn, N. Y.
Smith, Henry Leon, Detroit, Mich.
Smith, Kenneth McLane, Ann Arbor, Mich.
Smith, Wilson Fitch, Hartford, Conn.
Souders, Carlton Remsberg, Boston, Mass.
Stannus, Donald George, Miami Beach, Fla.

Stefanic, Edward Joseph, Lakewood, Ohio
Stefano, James Joseph, Brooklyn, N. Y.
Steigmann, Frederick, Chicago, Ill.
Stoneburner, Lewis T., III, Richmond, Va.
Strauss, Arthur Simpson, White Plains, N. Y.
Swindell, Orval Fisher, Boise, Idaho

Tempel, Carl Willard, (MC), U. S. Army
Tocantins, Leandro Maues, Philadelphia, Pa.
Top, Franklin Henry, Detroit, Mich.

Warr, Otis Sumter, Memphis, Tenn.
Weingarten, Michael, New York, N. Y.
Williams, Robert Jackson, Providence, R. I.
Willis, Willard Harlan, Detroit, Mich.
Winemiller, James Lewis, Great Neck, N. Y.
Woods, Bertrand Odell, Portland, Ore.

Yeager, Robert Lee, Jr., Trudeau, N. Y.
Young, Frank Walker, (MC), U. S. Army

AMERICAN COLLEGE OF PHYSICIANS TO MEET IN ST. PAUL, 1942

The Board of Regents announce that the Twenty-sixth Annual Session of the College will be held in St. Paul, Minn., April 20–24, inclusive, 1942, with general headquarters at the municipal auditorium. Hotel headquarters will be announced later.

The organization of the Session will be similar to that held in Boston, April, 1940, with hospital clinics and special lectures during the mornings, round table discussions around noon, and general sessions in the afternoons. The Convocation for the induction of new Fellows will be held on Wednesday evening and the Annual Banquet on Thursday evening.

The President, Dr. Roger I. Lee, 264 Beacon Street, Boston, Mass., will prepare the program of General Sessions and Morning Lectures. To him should be submitted applications for places on these programs.

Dr. John A. Lepak, 25 W. 4th Street, St. Paul, Minn., has been appointed General Chairman of the Session, and will have charge of the program of hospital clinics, round table discussions, entertainment and other local arrangements.

The general management of the Session, publication and distribution of programs, technical exhibits and related duties will be in charge of the Executive Secretary, Mr. E. R. Loveland, 4200 Pine Street, Philadelphia, Pa.

NEW LIFE MEMBERS OF THE COLLEGE

The following Fellows of the American College of Physicians have subscribed to Life Membership, and their initiation fees and Life Membership subscriptions have been added to the permanent Endowment Fund of the College:

Dr. Beaumont S. Cornell, Fort Wayne, Ind.
Dr. Perk Lee Davis, Philadelphia, Pa.

GIFTS TO THE COLLEGE LIBRARY

We gratefully acknowledge receipt of the following gifts donated to the College Library of Publications by Members:

Books

Dr. Bernard I. Comroe, F.A.C.P., Philadelphia, Pa.—"Arthritis and Allied Conditions";

Dr. Harold J. Harris (Associate), Westport, N. Y.—"Brucellosis (Undulant Fever): Clinical and Subclinical."

Reprints

Dr. George M. Decherd, Jr., F.A.C.P., Galveston, Tex.—1 reprint;
Dr. Charles F. De Garis, F.A.C.P., Oklahoma City, Okla.—3 reprints;
Dr. Karl L. Dickens (Associate), New Orleans, La.—4 reprints;
Dr. John N. Hayes, F.A.C.P., Saranac Lake, N. Y.—2 reprints;
Dr. Oswald F. Hedley, F.A.C.P., Bethesda, Md.—1 reprint;
Dr. Ben R. Heninger, F.A.C.P., New Orleans, La.—2 reprints;
Dr. John L. Kantor, F.A.C.P., New York, N. Y.—4 reprints;
Dr. Chester S. Keefer, F.A.C.P., Boston, Mass.—9 reprints;
Dr. Jacob J. Kirshner (Associate), Philadelphia, Pa.—4 reprints;
Dr. William B. Rawls, F.A.C.P., New York, N. Y.—2 reprints;
Dr. Richard Kohn Richards (Associate), North Chicago, Ill.—5 reprints;
Dr. Fred F. Senerchia, Jr. (Associate), Elizabeth, N. J.—1 reprint;
Dr. Jacob Jesse Singer, F.A.C.P., Los Angeles, Calif.—3 reprints;
Dr. Edward L. Tuohy, F.A.C.P., Duluth, Minn.—5 reprints;
Dr. Samuel Weiss, F.A.C.P., New York, N. Y.—1 reprint.

At the recent meeting of the Association of American Physicians Dr. James H. Means, F.A.C.P., Jackson Professor of Clinical Medicine at Harvard University Medical School and Chief of Medical Services at the Massachusetts General Hospital, was elected President of the Association. Among the other officers selected were: Dr. George Blumer, F.A.C.P., New Haven, Conn., Vice-President; Dr. Hugh J. Morgan, F.A.C.P., Nashville, Tenn., Secretary; Dr. Fred M. Smith, F.A.C.P., Iowa City, Iowa, Recorder; and Dr. William S. McCann, F.A.C.P., Rochester, N. Y., Treasurer.

Among the recent lecturers at the Woman's Medical College of Pennsylvania were: Dr. Sara M. Jordan, F.A.C.P., Boston, Mass., who spoke on "Peptic Ulcer"; and Dr. Walter C. Alvarez, F.A.C.P., Rochester, Minn., who spoke on "The Art of Medicine."

The first Annual Thomas McCrae Award of $100.00 was granted to Dr. Robert F. Norris and Dr. Alexander Rush for the best publication in 1940 by younger members of the Medical Staff of the Pennsylvania Hospital, Philadelphia, Pa., at a special meeting, April 22, 1941.

Dr. Henry A. Christian, F.A.C.P., Hersey Professor of The Theory and Practice of Physic, Emeritus, Harvard University, addressed the audience on "Scholarship in Medicine."

The Award, honoring Dr. McCrae, late Professor of Medicine at the Jefferson Medical College and late Chief of one of the medical services at the Pennsylvania Hospital, is to be granted annually to younger men of the Medical Staff for the best publication of work done primarily at the Pennsylvania Hospital.

Dr. Fred M. Meixner, F.A.C.P., Peoria, Ill., was elected President of the Illinois Tuberculosis Association at the annual meeting held recently.

Among the speakers at a meeting of the Eleventh District Medical Association of Texas, April 24, 1941, were: Dr. Ralph Bowen, F.A.C.P., Houston, Tex., who spoke on "Gastro-intestinal and Respiratory Allergy in Children"; and Dr. Roy Turner, F.A.C.P., New Orleans, La., who spoke on "Shock in Medical Conditions, Physiology and Treatment."

Under the Presidency of Dr. Henry I. Klopp, F.A.C.P., Allentown, the Pennsylvania Psychiatric Society held its second regular Mid-Year Meeting, April 10, 1941, at the Allentown State Hospital.

On May 13, 1941, Dr. Samuel M. Feinberg, F.A.C.P., Chicago, Ill., gave a series of lectures on allergy at the University of Michigan Medical School, Ann Arbor in connection with the Annual Michigan Postgraduate Program for graduates in medicine. On May 14, 1941, Dr. Feinberg addressed the meeting of the Tenth Councilor District of the Indiana State Medical Association on "Nasal Allergy." On May 22, 1941, he spoke on "Allergy to Therapeutic Substances" before the Section on Medicine of the Illinois State Medical Society.

Dr. Harold J. Harris (Associate) has been commissioned Lieutenant Commander in the Medical Corps of the U. S. Naval Reserve.

Dr. Louis H. Bauer, F.A.C.P., Hempstead, N. Y., was reëlected Speaker of the House of Delegates of the Medical Society of the State of New York at the annual meeting of the Society held at Buffalo, N. Y., April 29, 1941.

Dr. Chas. LeRoy Steinberg (Associate), Rochester, N. Y., gave a paper on "Dilute and Concentrated Preparations of the Tocopherols (Vitamin E) in the Treatment of Fibrositis" at the meeting of the Medical Society of the State of New York held at Buffalo, N. Y., April 29, 1941.

Recently, Dr. Steinberg was appointed a member of the Administrative Faculty of the School of Nursing to represent Medicine, at the Rochester General Hospital.

The Medical Society of New Jersey sponsored a Postgraduate Course in Pulmonary Tuberculosis at the Hudson County Tuberculosis Hospital, Jersey City, N. J.,

April 4–25, 1941. The course consisted of lectures, demonstrations, and round table discussions. Among those who conducted this course were:

Dr. Bernard S. Pollak, F.A.C.P.—Introduction to the Course;

Dr. Samuel Cohen (Associate)—" Clinical Classification of Pulmonary Tuberculosis ";

Dr. Abraham E. Jaffin, F.A.C.P.—" The Rôle of the Physician and the Clinic (Demonstration of Tuberculin-Testing) ";

Dr. Harry J. Perlberg, F.A.C.P.—" Interpretation of Fluoroscopic and X-Ray Findings in Pulmonary Tuberculosis."

The American Academy of Physical Medicine held its 19th Annual Meeting and Scientific Session in New York, N. Y., April 28–30, 1941. Among those who participated in the program of this meeting were:

Dr. Walter M. Solomon (Associate), Cleveland, Ohio—" Treatment of Fungus Infections by Iontophoresis ";

Dr. Frank H. Krusen, F.A.C.P., Rochester, Minn.—" Methods of Applying Heat Locally in General Practice ";

Dr. Irving Sherwood Wright, F.A.C.P., New York, N. Y.—" Physical Measures in Peripheral Vascular Disease ";

Dr. Charles M. Griffith, F.A.C.P., and Dr. Hugo Mella, F.A.C.P., both of Washington, D. C.—" Disabilities Encountered Among Veterans of the World War."

Under the Presidency of Dr. Anthony Bassler, F.A.C.P., New York, N. Y., the National Gastroenterological Association held its 6th Annual Convention May 13–16, 1941, at New York, N. Y. Among those who participated in the program were:

Dr. Charles A. Doan, F.A.C.P., Dr. Phillip T. Knies, F.A.C.P., and Dr. Clark P. Pritchett (Associate), all of Columbus, Ohio—" Aluminum Hydroxide vs. Gelatin in the Treatment of Hypertrophic Gastritis ";

Dr. Max Einhorn, F.A.C.P., and Dr. Henry A. Rafsky, F.A.C.P., both of New York, N. Y.—" Report of Two Cases of Probable Luetic Ulcers of the Stomach ";

Dr. Henry A. Monat (Associate), Washington, D. C.—" Underweight: A Problem in Treatment ";

Dr. Frank J. Gregg (Associate) and Dr. Roy R. Snowden, F.A.C.P., both of Pittsburgh, Pa.—" The Diagnosis of Functional Dyspepsia ";

Dr. Manfred Kraemer, F.A.C.P., Newark, N. J.—" Ulcerative Colitis and Its Management ";

Dr. Louis H. Clerf, F.A.C.P., Philadelphia, Pa.—" The Importance of Gastroscopy in the Differential Diagnosis of Gastric Ulcer and Carcinoma ";

Dr. Ralph Pemberton, F.A.C.P., Philadelphia, Pa.—" The Rôle of the Gastrointestinal Tract in the Syndrome of Chronic Arthritis ";

Dr. Lucius C. Sanders, F.A.C.P., Memphis, Tenn.—" Chronic Amebiasis."

Dr. Fred H. Voss, F.A.C.P., Kingston, N. Y., presided at a Round Table Conference on " A Consideration of the Newer Forms of Medical Therapy of Ulcers of the Stomach and Duodenum."

The 44th Annual Meeting of the American Gastro-enterological Association was held in Atlantic City, N. J., May 5–6, 1941, under the Presidency of Dr. Andrew C. Ivy, F.A.C.P., Chicago, Ill. Among the speakers at this meeting were:

Dr. Andrew C. Ivy, F.A.C.P., Chicago, Ill.—Presidential Address: " Some Recent Advances in the Physiology of the Alimentary Tract ";

Dr. Russell S. Boles, F.A.C.P., Philadelphia, Pa.—" Qualitative Circulatory Deficiencies Observed in Peptic Ulcer: 1. The Chemical Composition of the Blood ";

Dr. William A. Swalm, F.A.C.P., and Dr. Lester M. Morrison (Associate), both of Philadelphia, Pa.—" Pathologic and Gastroscopic Studies on the Incidence of Chronic Gastritis in Individuals with Gastric and Extra-Gastric Disease ";

Dr. James B. Carey, F.A.C.P., and Dr. Ragnvald S. Ylvisaker, F.A.C.P., both of Minneapolis, Minn.—" Gastroscopic Observations in Achlorhydria ";

Dr. Russell M. Wilder, F.A.C.P., Rochester, Minn.—" Nutrition Problems as Related to National Defense ";

Dr. Abraham H. Aaron, F.A.C.P., and Dr. Frank Meyers (Associate), both of Buffalo, N. Y.—" Toxicity Studies on Stilbestrol ";

Dr. Martin E. Rehfuss, F.A.C.P., Ardmore, Pa.—" Study of the Liver Bile as Obtained by Duodenal Intubation ";

Dr. Charles A. Jones (Associate), Philadelphia, Pa.—" A Clinical and Laboratory Study of the Plasma in Obstructive Jaundice and Several Types of Non-Obstructive Jaundice ";

Dr. John G. Mateer, F.A.C.P., and Dr. James I. Baltz (Associate), both of Detroit, Mich.—" A Comparative Evaluation of the Newer Liver Function Tests ";

Dr. Seale Harris, F.A.C.P., and Dr. Seale Harris, Jr., F.A.C.P., both of Birmingham, Ala.—" The Genesis of Pellagra, Pernicious Anemia, and Sprue ";

Dr. Rollin H. Moser, F.A.C.P., and Dr. Bernard D. Rosenak, F.A.C.P., both of Indianapolis, Ind.—" Gallbladder Dyspepsia ";

Dr. Philip W. Brown, F.A.C.P., Rochester, Minn.—" The Prognosis of Regional Enteritis ";

Dr. Albert F. R. Andresen, F.A.C.P., Brooklyn, N. Y.—" Ulcerative Colitis—An Allergic Phenomenon? ";

Dr. Johannes Pessel, F.A.C.P., Trenton, N. J., and Dr. Jay M. Garner (Associate), Winnetka, Ill.—" Value of Color Stills and Cinematographic Records in Teaching Diseases of the Rectum and Sigmoid."

Dr. Russell S. Boles, F.A.C.P., Philadelphia, Pa., is First Vice-President of the Association; Dr. Sara M. Jordan, F.A.C.P., Boston, Mass., is Second Vice-President; Dr. Abraham H. Aaron, F.A.C.P., Buffalo, N. Y., is Treasurer; Dr. J. Arnold Bargen. F.A.C.P., Rochester, Minn., is Recorder; and Dr. Thomas T. Mackie, F.A.C.P., New York, N. Y., is Secretary.

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The Graduate Fortnight of The New York Academy of Medicine will be held October 13–24, 1941. The subject this year is " Cardiovascular Diseases Including Hypertension." The Fortnight will present a carefully integrated program which will include panel discussions, clinics and clinical demonstrations, evening addresses, and a scientific exhibit. The evening sessions will be addressed by recognized authorities from leading medical centers of the United States and Canada. Among those who will participate in the program of evening lectures are:

Dr. Carl J. Wiggers, F.A.C.P., Cleveland, Ohio—" Basic Hemodynamic Principles Essential to Interpretation of Cardiovascular Disorders ";

Dr. Paul D. White, F.A.C.P., Boston, Mass.—" Heart Failure ";

Dr. Robert L. Levy, F.A.C.P., New York, N. Y.—" Diagnosis and Treatment of Coronary Insufficiency ";

Dr. George Morris Piersol, F.A.C.P., Philadelphia, Pa.—" Observations on Social Significance and Recent Advances in the Treatment of Arteriosclerosis ";

Dr. Emanuel Libman, F.A.C.P., New York, N.Y.—" Advances in Our Knowledge of Endocarditis—With Special Reference to the Therapy of Subacute Bacterial Endocarditis ";

Dr. Bernard S. Oppenheimer, F.A.C.P., New York, N. Y.—" Neurocirculatory Asthenia and Related Problems in Military Medicine ";

Dr. Edwin P. Maynard, Jr., F.A.C.P., Brooklyn, N. Y.—" Syphilis of the Cardiovascular System ";

Dr. Arthur C. DeGraff, F.A.C.P., New York, N. Y.—" Evaluation of Drugs Used in the Treatment of Cardiovascular Diseases ";

Dr. Irving S. Wright, F.A.C.P., New York, N. Y.—" Thrombophlebitis ";

Dr. Edgar V. Allen, F.A.C.P., Rochester, Minn.—" Thromboangiitis Obliterans ";

Dr. Harold E. B. Pardee, F.A.C.P., New York, N. Y.—" Management of Heart Disease in Pregnancy ";

Dr. Soma Weiss, F.A.C.P., Boston, Mass.—" Mechanism and Treatment of Pulmonary Edema."

In connection with the " Clinical Day " presented by the Alumni Association of the University of Buffalo Medical School, April 5, 1941, at Buffalo, N. Y., Dr. Nelson G. Russell, F.A.C.P., Governor for Western New York, invited all members of the College, residing in this district, to be his guests for dinner.

Dr. William G. Leaman, Jr., F.A.C.P., Philadelphia, Pa., presented a paper on " Some Curable Types of Heart Disease " before the members of the Middlesex (N. J.) County Medical Society on March 19, 1941. On May 5, he addressed the 17th Annual Meeting of the American Association of the History of Medicine on " The Rôle of the Spanish Mission of California in Early American Medicine." On May 12, Dr. Leaman was the guest speaker at the annual meeting of the West Virginia Heart Association held in Charleston, W. Va. The subject of his address was " Prognosis in Heart Disease." On May 13, Dr. Leaman addressed the 74th Annual Meeting of the West Virginia Medical Association on " Recent Advances in Our Knowledge of Cardiovascular Disease with Special Reference to Their Clinical Application."

Dr. Joseph C. Doane, F.A.C.P., Professor of Clinical Medicine, Temple University, has been appointed a member of the Board of Health of Philadelphia, Pennsylvania. The other members of the Board are Dr. Hubley R. Owen, Director of Public Health, and Dr. Arthur Parker Hitchens, Professor of Preventive Medicine, University of Pennsylvania.

NATIONAL DEFENSE POSITIONS FOR NURSES

The United States Civil Service Commission has announced a drive for nurses to fill important national defense positions. Two new Civil Service examinations in the nursing field are announced.

Announcement No. 88—Junior Graduate Nurse, $1,620 a year; U. S. Public Health Service, Federal Security Agency; Veterans Administration; and Indian Field Service, Department of the Interior. Applicants will no longer be required to

take a written test, and the vision requirement has been modified. Applications will be rated as received until further public notice.

Announcement No. 85—Associate Public Health Nursing Consultant, $3,200 a year; Assistant Public Health Nursing Consultant, $2,600 a year; applications must be filed with the U. S. Civil Service Commission at Washington, D. C., not later than July 26, 1941. Examination is open only to registered graduate nurses who have completed a four-year College course, including, or supplemented by, at least one year of study in public health nursing, and have had experience in public health nursing supervision. Competitors will not be required to take a written test.

Full details of requirements may be obtained about any of the above appointments by communicating with the Civil Service Commission, Washington, D. C. Announcements from the Commission state that the need is urgent.

OBITUARIES

DR. JOHN J. McGOVERN

Dr. John J. McGovern, a staunch supporter of organized medicine throughout all his professional life, passed away at his home, 2123 W. Highland Avenue, Milwaukee, on January 14, 1941. He had been ill for several years.

Dr. McGovern was born at Elkhart Lake, Wisconsin, February 14, 1864. Following his student days at the University of Wisconsin, he studied at Rush Medical College in Chicago, but was graduated from the University of Pennsylvania School of Medicine in Philadelphia in 1893. For the following two years, he was house physician at the University of Virginia Hospital. He then came back to Wisconsin and practised medicine in Milwaukee for almost fifty years, until his health became too poor to allow of further professional work.

He was a member of the staff at the Columbia Hospital and Johnston Emergency Hospital in Milwaukee. He was elected President of the Milwaukee County Medical Society in 1912. In 1928 he was made President of the State Medical Society of Wisconsin. He was also a member of the Milwaukee Academy of Medicine, Fellow of the American Medical Association, and became a Fellow in the American College of Physicians in 1927. He served one term as a member of the House of Delegates of the American Medical Association.

Dr. McGovern has given much of his time and energy for the progress of the medical profession. He was instrumental in securing the passage of the basic science law in Wisconsin and as a consequence, was given the Distinguished Service Award by the State Medical Society in 1931.

Surviving Dr. McGovern are his wife, Mrs. Grace Neilson McGovern, one brother, Francis E. McGovern, former Governor of the State of Wisconsin, and two daughters, three sons, and two grandchildren.

ELMER L. SEVRINGHAUS, M.D., F.A.C.P.,
Governor for Wisconsin

DR. HENRY KELLER MOHLER

Dr. Henry Keller Mohler, born 1887, died very suddenly on May 16, 1941, at his home, 480 N. Latches Lane, Merion, Pennsylvania.

Dr. Mohler received his M.D. from Jefferson Medical College of Philadelphia in 1912. He also held a degree of Ph.D. from the Philadelphia College of Pharmacy, and an honorary degree of D.Sc.

He was a renowned practitioner of Internal Medicine and Cardiology for many years. Since 1938, Dr. Mohler has been Dean of Jefferson Medi-

cal College of Philadelphia and also Sutherland M. Prevost Professor of Therapeutics.

Other positions which claimed his brilliant and scholarly mind were: Attending Physician and Physician in Charge of Sub-Department of Electro-cardiology, Jefferson Hospital since 1938; Member of the Philadelphia Board of Health, and, for many years, Medical Director of Jefferson Hospital.

Dr. Mohler also claimed distinction as an author, being Associate Editor of " Cyclopedia of Medicine, Surgery and Specialties," and a contributor to Reimann's " Treatment in General Medicine." He was a Fellow of the American College of Physicians since 1923; also a member of the Philadel-phia County Medical Society, the Pennsylvania State Medical Society, and a Fellow of the College of Physicians of Philadelphia and of the American Medical Association.

In the passing of Henry Mohler, Philadelphia Medicine has lost one of its outstanding members. He was deeply loved and respected by his colleagues, all of whom, together with a host of friends, accept with a sense of shock and grief, the untimely death of one so alive to the art and joy of living.

EDWARD L. BORTZ, M.D., F.A.C.P.,
Governor for Eastern Pennsylvania

DR. WENDELL HEATH PAIGE

Dr. Wendell Heath Paige of Brownwood, Texas, died on February 14, 1941. He was born in Rutland, Vermont, on April 26, 1886, and received the degree of Doctor of Medicine from George Washington University in 1911. He served his internship at the George Washington University Hospital during 1911. During 1912 he served as Resident Physician at Starmont Sanitarium. Since 1926 he had been Internist and Director of Laboratory at the Medical Arts Hospital in Brownwood, of which organization he was one of the founders.

During the first World War Dr. Paige served in the Medical Corps of the United States Army, spending eleven months in France with the 144th Infantry, 36th Division, where he was awarded the Croix de Guerre for dis-tinguished service. Since 1936 he had been Chairman of the Brown County Parole Board. He was a member of the Brown-Comanche-Mills-San Saba Counties Medical Society, the Fourth District Medical Society of Texas, of which he was president during 1938 and 1939, the State Medical Associa-tion of Texas, Texas Railway Surgeons Association, the American Heart Association, a Fellow of the American Medical Association and a Fellow of the American College of Physicians since 1938. In the death of Doctor Paige medicine has lost a staunch supporter of those principles for which the American College of Physicians stands, and he will be missed by all who knew him.

DR. STEWART RALPH ROBERTS

Dr. Stewart Ralph Roberts, aged 62, former member of the Board of Regents and former vice-president of the American College of Physicians, died April 15, 1941, at Atlanta, Georgia. He had been confined to his home only a few days, though he had never completely recovered from an illness which began in 1938.

Dr. Roberts was noted as a diagnostician and specialist in internal medicine and cardiology. During the World War he was chief of medical service of the Emory Unit Base Hospital No. 43, which he helped to organize. He was later transferred to Fort Jackson, Columbia, S. C., where as Lieutenant Colonel he was commanding officer of the base hospital. Dr. Roberts had unusual abilities as a lecturer and speaker. He was also a frequent contributor to medical journals. In 1912 he published " Pellagra," a definitive volume on the subject of this disease, in the preparation of which he made special studies at Harvard and in Europe.

Dr. Roberts received his degree of doctor of medicine from the Atlanta College of Physicians and Surgeons (later Emory University School of Medicine) in 1900, before reëntering Emory, to receive his A.B. degree in 1902. He was graduated with first honors. From the University of Chicago he received his degrees of bachelor of science and master of science. He then returned to teach biology, zoölogy, and physiology. After three years he moved to Atlanta, where he began to practice medicine with conspicuous success. He also taught in the medical school, which in 1915 became a part of Emory University. Since that time he has been professor of clinical medicine at Emory University.

Dr. Roberts had been president of the American Heart Association, the Southern Medical Association and the Fulton County Medical Society. He was a founder of the Emory Chapter of Phi Beta Kappa, and was a member of the Kappa Alpha Fraternity and various medical and honor societies.

GLENVILLE GIDDINGS, M.D., F.A.C.P.,

Governor for Georgia

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